MAY, 1947

WIRE AND WIRE PRODUCTS

VAUGHN
MOTOBLOX
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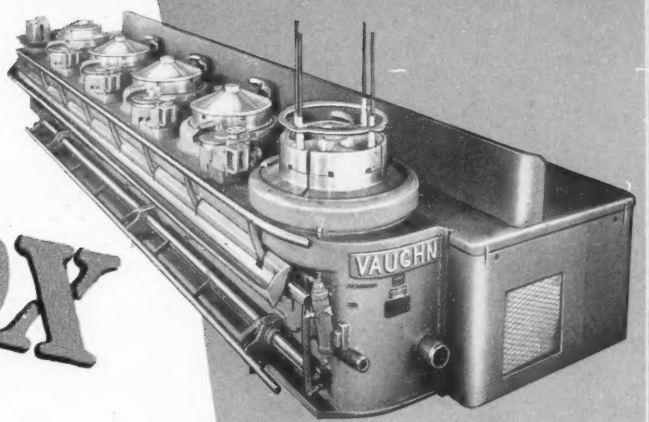
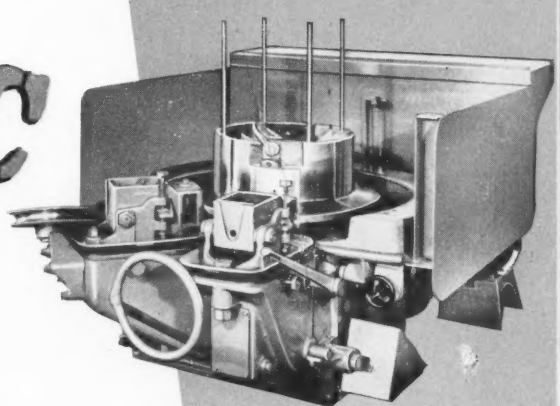
MOTOBLOC





NAMES FAMILIAR TO EVERY WIRE DRAWING PRODUCER . . .

MACHINES that build profits by better wire drawing performance . . .

COMPLETE COLD DRAWING EQUIPMENT
Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

VAUGHN MACHINERY
PROFITABLY USED BY LEADING WIRE MILLS SINCE 1860 . . .

THE VAUGHN MACHINERY COMPANY CUYAHOGA FALLS, OHIO, U. S. A.

FFICIAL PUBLICATION OF THE WIRE ASSOCIATION

WEAN ENGINEERING Company, Inc.

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SPECIALISTS IN SHEET TIN AND STRIP MILL EQUIPMENT

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are recognized as specialists in high-efficiency strip and wire mill equipment.

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For 36" Wide Material and Narrower

MILLS • REELS • SLITTERS • LEVELERS • COILERS
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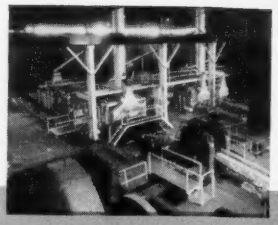
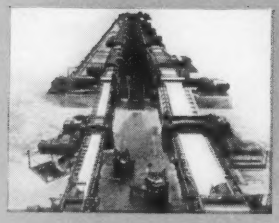
WIRE MILL EQUIPMENT

WIRE DRAWING MACHINES • PATENTING • GALVANIZING AND TINNING TAKE-UP FRAMES • WIRE FLATTENING • SPOOLERS • NAIL GALVANIZING AND BLUEING FIELD FENCE and BARBED WIRE MACHINES

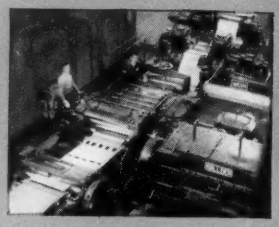
Annealing Furnaces



Mechanized Sheet Mill

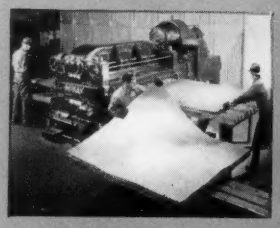


Pickle Line

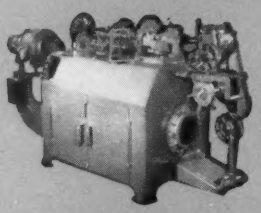


Tin Plate Shearing

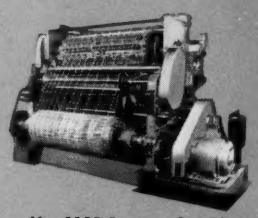
Electrolytic Line



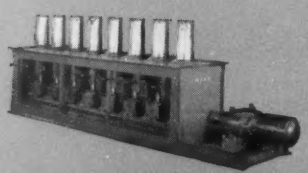
Backed Up Leveller For Wide Sheets



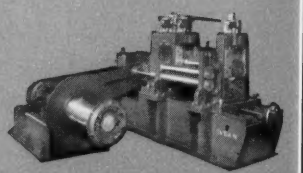
Barbed-Wire Fence Machine



No. 1155 Farm and Field Fence Machine

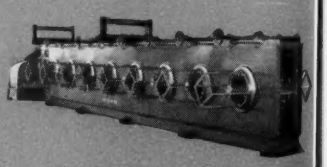


8 Block Fine Wire Tinning Take-up Frame



Strip Reel and Slitting Unit

HOLMQUIST BARBED WIRE AND WIRE FENCE MACHINERY

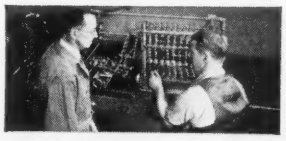


16 Block Wire Galvanizing Frame

Yours . . .

as a Carboloy Die user . . .

This "COMPLETE PACKAGE" Die Service!



SERVICE CENTERS AND FIELD ENGINEERS

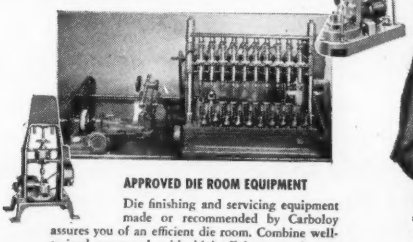
Here's "double-help" for you: Completely equipped Die Service Centers (in Detroit, Chicago, Pittsburgh & Thomaston)—AND expert field Engineers—both available to help you in servicing or finishing dies.

LOCAL STANDARD STOCKS TO SUPPLY YOU PROMPTLY

A great aid to you in maintaining production schedules! Stocked in Detroit, Los Angeles, Pittsburgh, Chicago and Thomaston, Conn.—assuring speedy delivery in metal-working areas coast-to-coast.

FREE TRAINING OF YOUR PERSONNEL

In Carboloy's Die Training School in Detroit, your die room personnel receive thorough training in carbide die application and maintenance methods. Up-to-the-minute training for newcomers or seasoned veterans!



APPROVED DIE ROOM EQUIPMENT

Die finishing and servicing equipment made or recommended by Carboloy assures you of an efficient die room. Combine well-trained personnel with high-efficiency equipment and it spells fast die finishing in *your* mill.

4 Valuable Services FREE, To Boost Your Profits!

Here's a "profit-team" that's hard to equal!

FIRST—Dies that are known throughout Industry for amazingly long life, closer tolerances on drawn parts, fewer "rejects", lower cost-per-piece, and fine surface finish.

And—

SECOND—4 Valuable extra services that cost you nothing, and boost production, speed output, and help increase earnings in your mill.

You get *both* when you order Carboloy Cemented Carbide Dies. Why not take advantage of these profit-increasing services? Carboloy Co., Inc., 11171 E. 8 Mile Blvd., Detroit 32, Mich.

CARBOLOY
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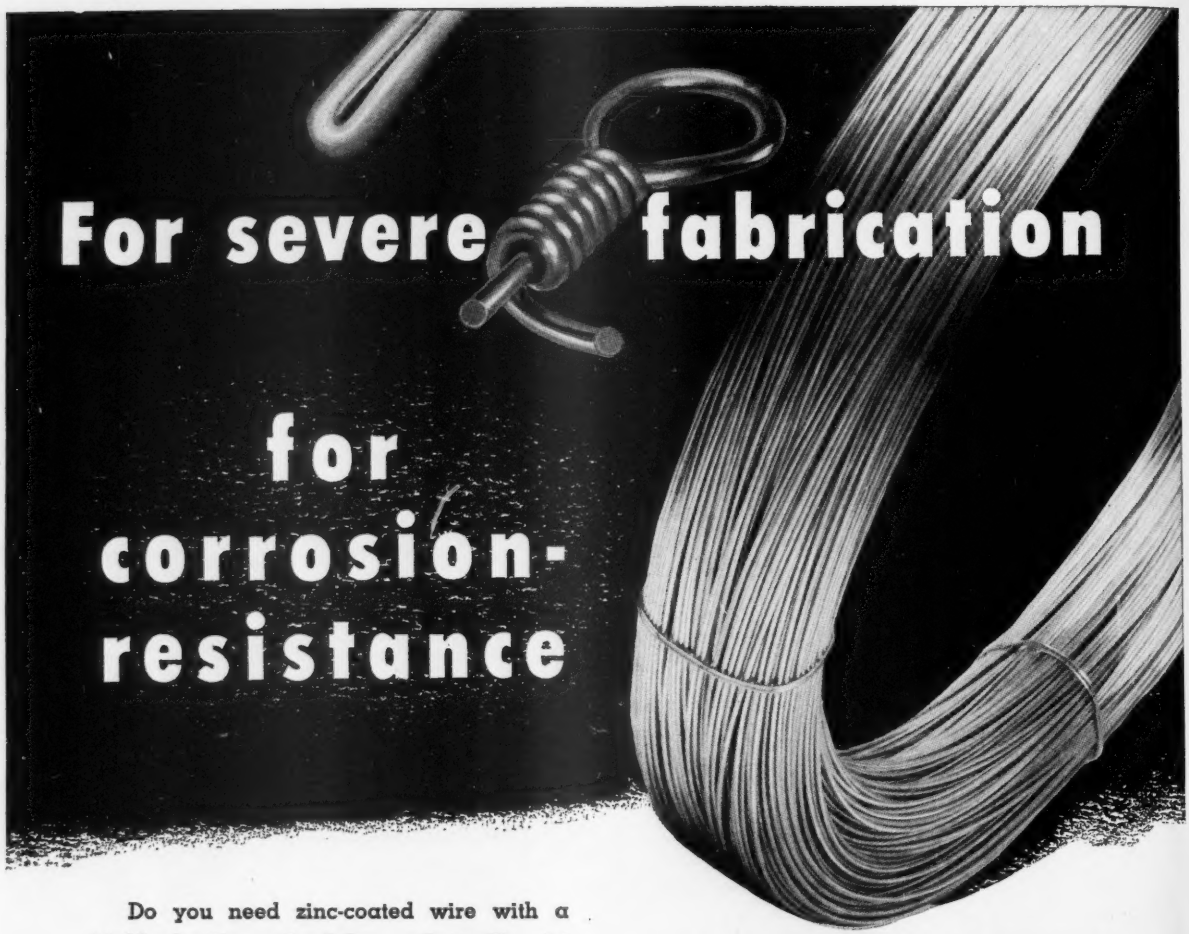
CEMENTED CARBIDES

For severe fabrication for corrosion-resistance



Bethanized wire has a ductile coating of pure zinc. It can be bent severely, twisted around its own diameter, even drawn to fine gauge without cracking or peeling of the zinc coating.

Do you need zinc-coated wire with a highly-ductile coating? Or one that will resist severe corrosion? Bethanized wire is the answer to *both* requirements.

Bethanized wire is coated with pure zinc (99.9 pct pure) by an electrolytic process which deposits on the wire a uniform coating to almost any desired thickness. The bond between steel and zinc is so tight that the bethanized coating takes the most difficult forming or fabricating operations without cracking, flaking, or peeling. In fact, bethanized wire can be bent flat on itself, wrapped around its own diameter—even drawn through dies to fine gauge—and the ductile zinc coating remains undamaged.

The bethanized coating locks out corrosion so effectively because of the purity of the zinc and the uniform thickness of the coating both around and along the wire. In addition to providing extra protection in normal service, the bethanized coating is available for exceptionally severe corrosive conditions in weights up to three times as heavy as those called for in conventional Type 3 galvanizing.

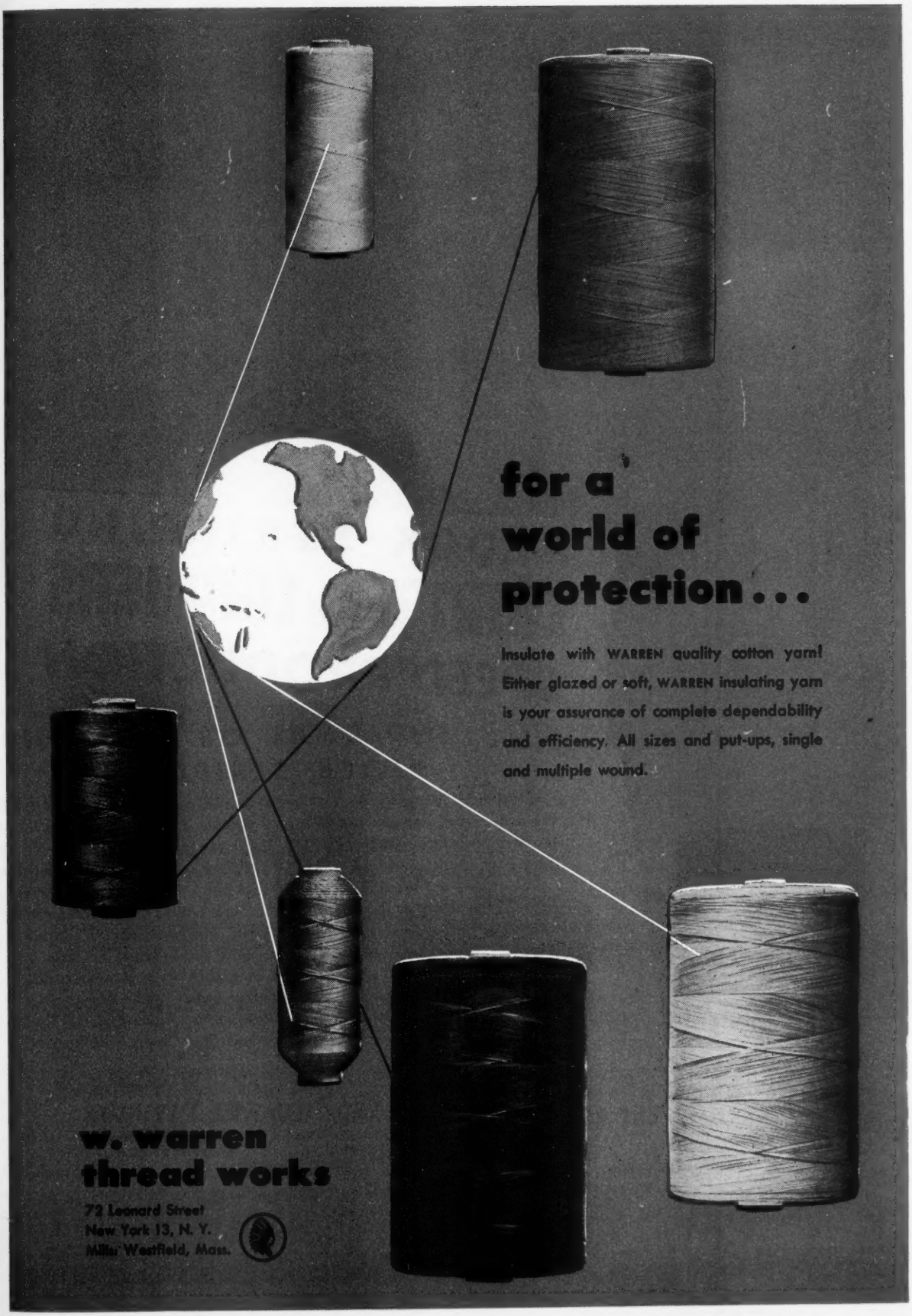
Perhaps bethanized wire is the answer to one of your production jobs. Naturally we'll be glad to cooperate in every way possible. There's a Bethlehem district office near you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

★ Bethanized Wire ★ BETHLEHEM STEEL ★

WIRE & WIRE PRODUCTS, Vol. 22, No. 5, May, 1947, Publication Office, at 61 Cliff St., New York 7, N. Y. Executive Office, 300 Main St., Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Scy. and Treas. Subscription price: U. S., $5.00; Canada, $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, June 14, 1946, at the Post Office, New York, N. Y., under Act of March 3, 1879.


for a
world of
protection . . .
Insulate with WARREN quality cotton yarn! Either glazed or soft, WARREN insulating yarn is your assurance of complete dependability and efficiency. All sizes and put-ups, single and multiple wound.
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thread works
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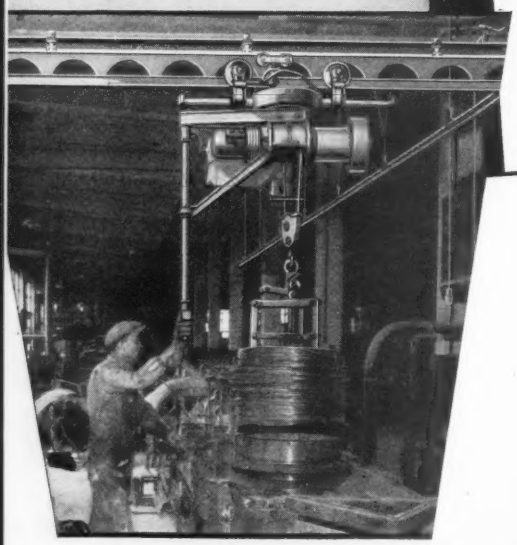
Mills: Westfield, Mass.

BLOCK STRIPPING CRANES and CARRIERS SPEED PRODUCTION



FOR INTERNAL OR EXTERNAL BLOCK STRIPPING

Cleveland Tramrail block stripping cranes and carriers make possible the drawing of heavier bundles and permits a man to take care of more blocks. With this equipment older experienced men can usually keep pace with younger men. Hernia injuries from heavy lifting are eliminated.

The cranes or carriers are easily propelled by hand by means of a rigid arm. At the lower end of the arm is a push button station for convenient operation of the electric hoist. If desired, the hoist may be mounted on a turn-table for ready service to blocks on two sides of an aisle.

Cleveland Tramrail equipment is available for internal stripping, as well as for external stripping of old style non-slotted blocks.

Equipment for block stripping is only one of many items Cleveland Tramrail has developed for the Wire and Wire Products Industry.

BOOKLET No. 2008 . . Packed with valuable information. Profusely illustrated. Write for free copy on your company letterhead.

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THE CLEVELAND CRANE & ENGINEERING CO.
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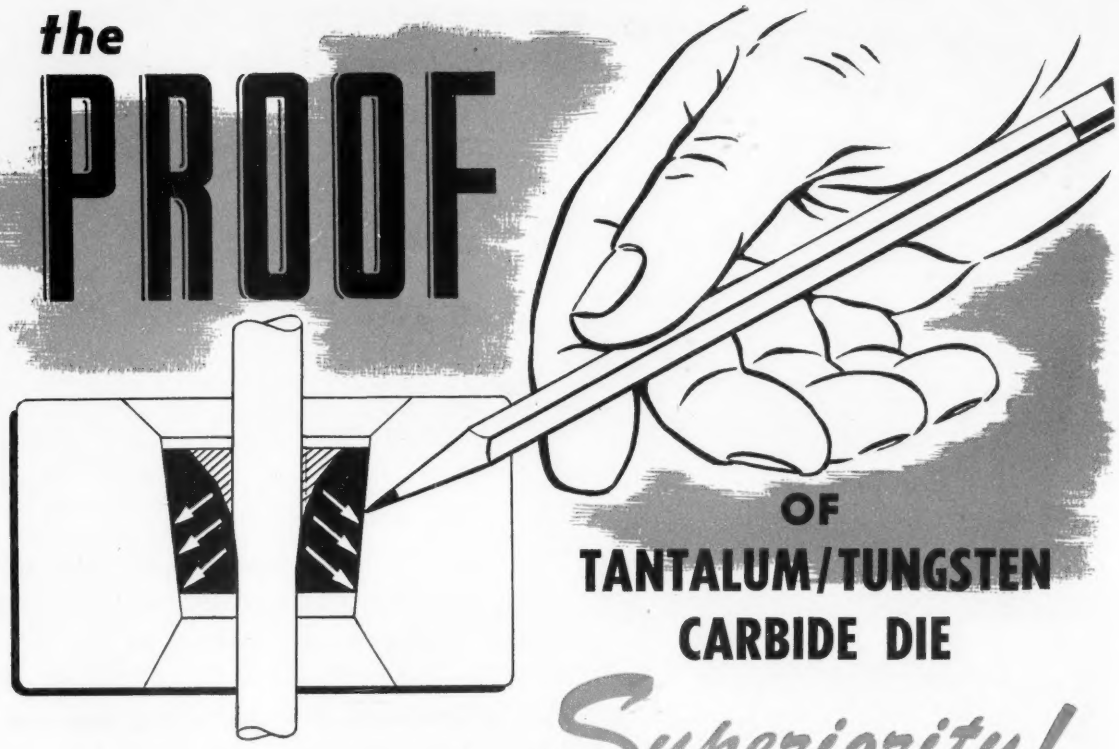
MANUFACTURERS OF • CLEVELAND CRANES • CLEVELAND TRAMRAIL • STEELWELD BENDING PRESS

CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT

the PROOF OF TANTALUM/TUNGSTEN CARBIDE DIE *Superiority!*



The V-R "Tapered Nib" standard round hole carbide die design is the most important and practical improvement in die design offered to industry in the past decade.

GREATER STRENGTH — Tapered nib design increases absorption of drawing stresses. Side walls of nib are taper-gripped resulting in tremendous internal strength.

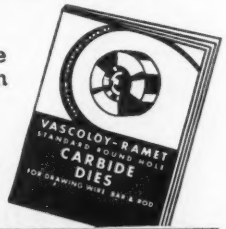
SIMPLE MAINTENANCE — Tapered grip casing means no steel casing to cut for refinishing or resizing . . . a real saver.

MAXIMUM VISIBILITY — Extra wide tapered front and back openings permit simple easy inspection.

CONCENTRICITY — V-R method of precision die manufacturing assures you of a perfect, concentric drawing surface.

FREE OF POROSITY — Another outstanding achievement of V-R die quality control is the elimination of porosity in carbide.

HIGHER FINISHES — V-R Tantalum/Tungsten carbide die nibs take a higher finish than any other die material.



MAKERS OF WORLD'S FINEST VR Carbides

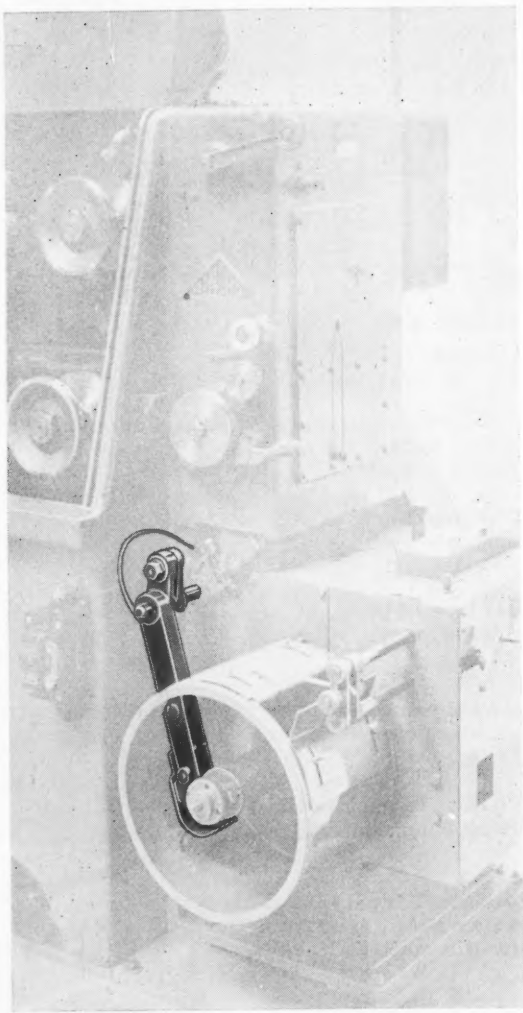
Write for your copy of Carbide Die Bulletin VR-348 today!

VASCOLOY-RAMET CORPORATION NORTH CHICAGO ILLINOIS, U. S. A.

District Sales and Service in Principal Cities

AN AFFILIATE OF FANSTEEL METALLURGICAL CORPORATION AND VANADIUM ALLOYS STEEL COMPANY

THE COURAGE TO BREAK WITH TRADITION



BRAWN and sulphurous language were required to start automobile engines until Kettering found a better way — the self starter.

In spooling wire, various methods have been tried to progressively reduce the rotating speed of the spool as the wire builds up on it. Some methods were subject to variations in driving force, some left dirty deposits on the wire. Others employed a roller arm in constant contact with the coil, which resulted in "burning" of the wire in modern high speed operation.

It remained for Syncro engineers to find the logical method — a method upon which basic patents have been granted. The Syncro spooling control mechanism makes only momentary contact with the wire — at the high spots. The contact is very light, because it only initiates the action of the speed changer, which eliminates danger of "burning" the wire. The spooled wire is clean — no further cleaning is required before enameling. The wire can be spooled tightly or loosely as required.

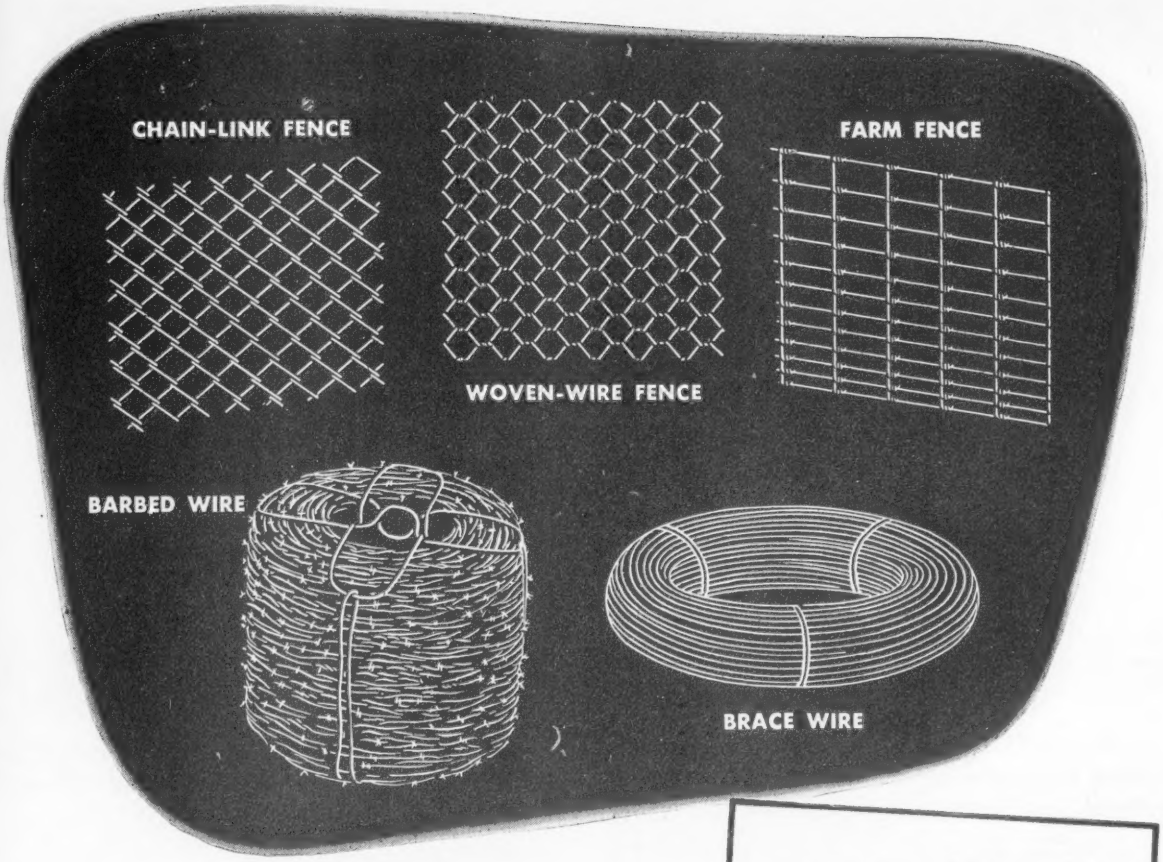
Here is another example of the progressive thinking of Syncro engineers which makes Syncro equipment the top producer in wire and cable mills throughout the world.

SYNCRO MACHINE COMPANY

EXECUTIVE OFFICES AND GENERAL WORKS — 611 SAYRE AVENUE, PERTH AMBOY, N. J.

Machinery for the Wire Industry

SYNCRO



You can get it **NOW...**

ALCOA ALUMINUM WIRE

FOR FENCES

The aluminum wire you need for fences is readily available from Alcoa. Phone your nearest Alcoa sales office. ALUMINUM COMPANY OF AMERICA, 1828 Gulf Bldg., Pittsburgh 19, Penna. Sales offices in leading cities.

Check these advantages of
ALUMINUM

- **THREE FOR ONE**

One pound of aluminum produces *three* times as many feet of wire as a pound of steel, copper, or stainless steel.

- **CORROSION RESISTANCE**

Aluminum does not rust or stain. Needs no painting to protect it.

- **EASY TO WORK**

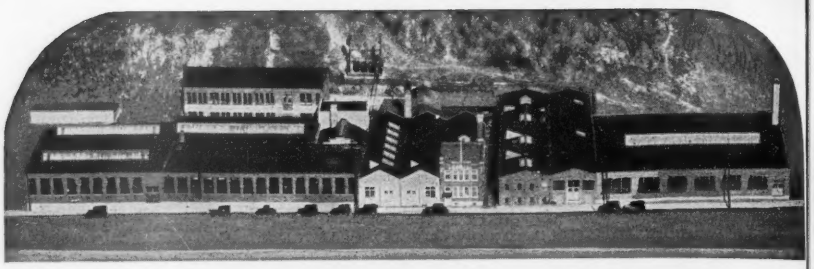
Aluminum wire can be bent, twisted, and fastened on your present equipment.

MORE people want MORE aluminum for MORE uses than ever

ALCOA FIRST IN ALUMINUM

IN EVERY COMMERCIAL FORM

HUDCO



HUDSON WIRE CO. PLANT AT OSSINING, N. Y.

This plant is one of the most up-to-date and completely equipped plants in the world for the production of "HUDCO" fine wires in all metals.

ESTABLISHED IN 1902

HUDCO

WIRES FOR METAL SPRAYING

Pure lead, Lead Alloy, Pure Zinc, Zinc Alloy, Copper, Tin, High Brass, Low Brass, Solder Wire. High Conductivity, Electric Wire. Cadmium, Nickel Silver, Aluminum, Monel Metal, Phosphor Bronze, Pure Nickel, Commercial Bronze, Brush Wires, Crimp and Straight, Brass, Steel, Nickel Silver, Copper and Phosphor Bronze.

HUDCO

FINE BARE WIRES

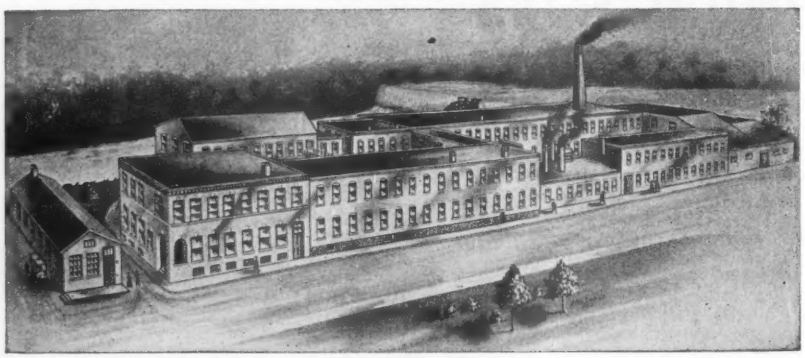
High Brass, Low Brass, Zinz 99.99+ and High Tensile Zinc, Commercial Bronze, Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Tinsel Lahns, Silver Plated Copper, False Gold and Copper. Cadmium, Nickel Silver, Silver Plated Copper, False Gold and Special Brass and Bronze Alloys to Specification, Metallic Fibre for Packing Purposes, Copper, Bronze, Zinc, Lead and Aluminum.

"HUDCO" specially processed Copper Wire for enamelling purposes is drawn from selected Copper, insuring the maximum conductivity. This is but one example of the use of the most advanced and approved materials and methods in our processing.

BETTER WIRE AT LOWER COST

Send Us Your Specifications and Let Us Quote Prices

HUDSON WIRE COMPANY • OSSINING, N. Y.



WINCO

Winsted Division of HUDSON WIRE CO. at Winsted, Conn., modern and completely equiped enamelled wire plant for LEAKPROOF ENAMELLED WIRE and all standard and special coverings.

"WINCO" enamelled wire is drawn from special selected copper, assuring perfect enamelling. All wire tested before shipment.

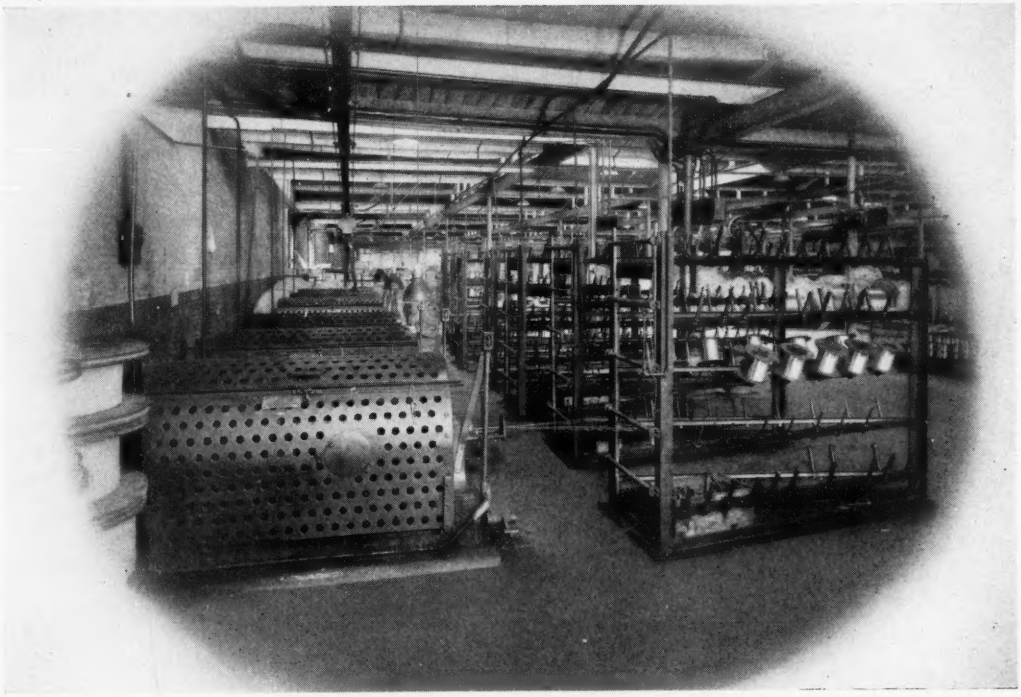
"WINCO" enamelled wire is available in all standard and special coverings made to meet exacting requirements.

Samples of LEAKPROOF and other enamelled wires sent on request

WINSTED DIVISION OF HUDSON WIRE COMPANY

WINSTED, CONN.

HIGH SPEED BUNCHERS



The illustration shows but one of the many high speed buncher installations made in the wire mills of the United States and Canada.

Large batteries of BUTT BUNCHERS may be found in nearly every electrical wire mill, as they have proved to be the economical medium for bunching or twisting together small wires.

BUTT BUNCHERS are built in two sizes:

S-31 for strands up to No. 14
S-35 for strands up to No. 8

FEATURES INCLUDE:

Use of standard shop reels — max. size 24" dia. x 12-3/4" O. A. width
Double drum grooved capstans — large diameters
Anti-friction bearings
Sturdy construction with low center of gravity
Substantial guards and safety features
Quick acting automatic brakes

Write for circular No. 63

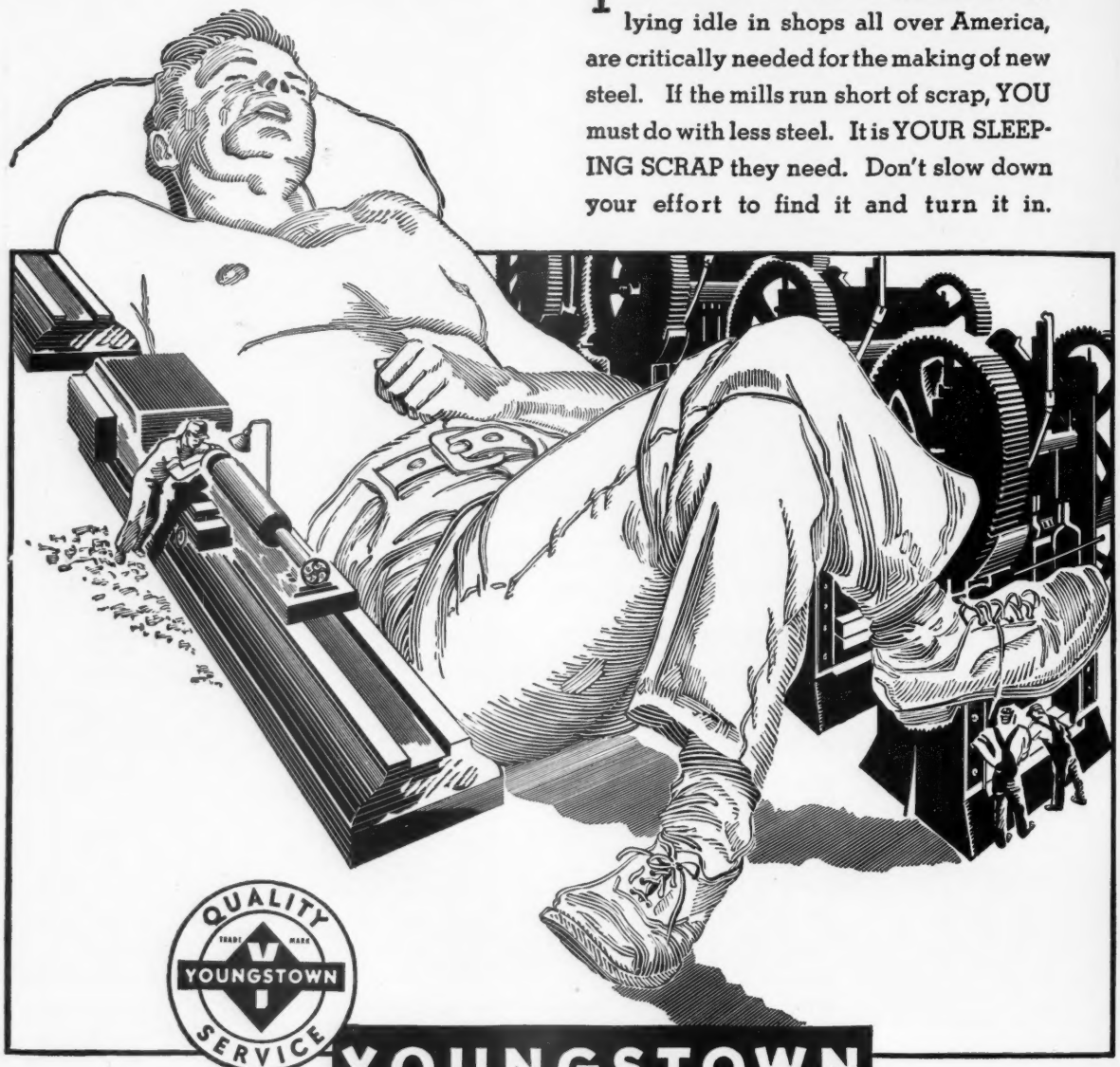
NEW ENGLAND BUTT COMPANY

ESTABLISHED 1842
304 PEARL STREET
PROVIDENCE 7, RHODE ISLAND, U. S. A.
JAMES DAY (MACHINERY) LTD., "FORD HOUSE," 88 REGENT ST., LONDON, W. 1. ENGLAND

WAKE SLEEPING SCRAP!

Put this giant to work at once, making STEEL

THE millions of tons of dormant scrap, lying idle in shops all over America, are critically needed for the making of new steel. If the mills run short of scrap, YOU must do with less steel. It is YOUR SLEEPING SCRAP they need. Don't slow down your effort to find it and turn it in.



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THE YOUNGSTOWN SHEET AND TUBE COMPANY

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Manufacturers of

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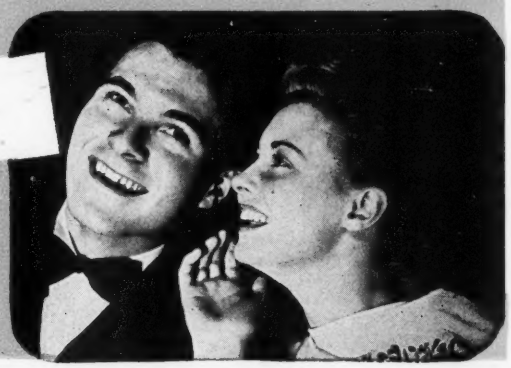
Pipe and Tubular Products-Sheets-Plates-Conduit-Bars-Rods-Wire-Electrolytic Tin Plate-Coke Tin Plate-Cold Drawn Carbon Steel Rounds - Tie Plates and Spikes.

THE LEAD-IN CABLE THAT MAKES THE DIFFERENCE



INSULATED WITH Du Pont POLYTHENE

With the home television set, much of the attenuation and distortion of images that sometimes occurs on the screen may arise in the lead-in cable from the antenna to the instrument. But not with the new Type ATV cable shown here. With this cable, attenuation is minimized . . . images are strong and clear.

The unusual design of this new lead-in line deserves much credit for its high effectiveness. But note—what makes this design possible is the excellent electrical properties of the insulation, of Du Pont polythene.

Because of polythene's remarkable dielectric strength, a thin coating of it is all that is needed. Polythene's low power factor makes it unusually effective in every type of high-frequency circuit. Credit also polythene's light weight (specific gravity 0.92) and its ability to retain its toughness and flexibility over a wide range of temperatures.

For complete data sheet on polythene, write to E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept., Room 155, Arlington, N. J.

Du Pont manufactures polythene molding powder.

Commercial extruders convert polythene into the form of

Type ATV two-wire polythene-insulated cable, for use as television lead-in line between antenna and receiver, made by Anaconda Wire & Cable Co. (Photo 2.5 times actual size.) This rugged, flexible cable, one of the lightest of its type, has an attenuation of 0.75 db/100 feet, and an impedance of 300 ohms at 50 megacycles.

DU PONT
REG. U. S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
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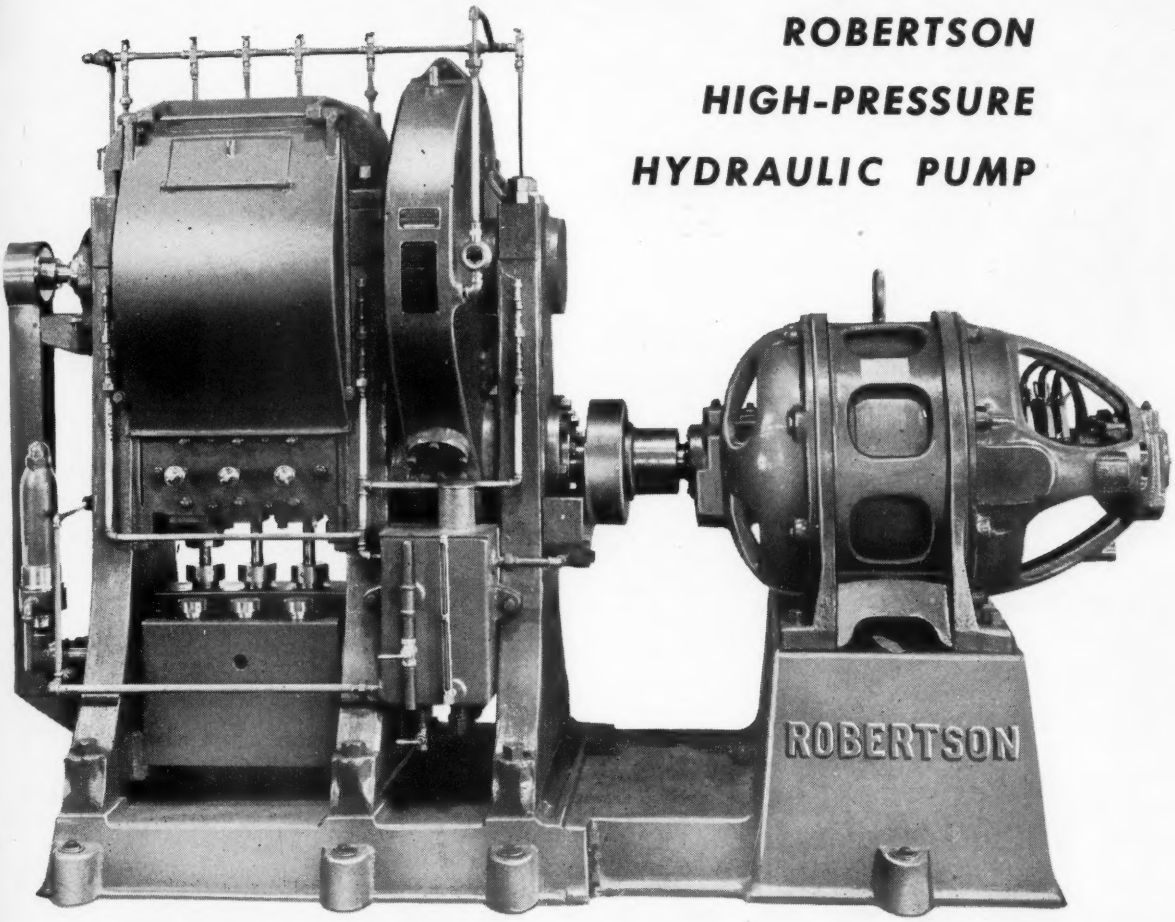

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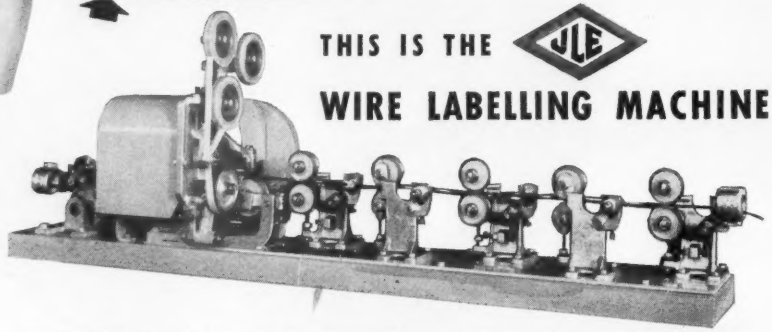

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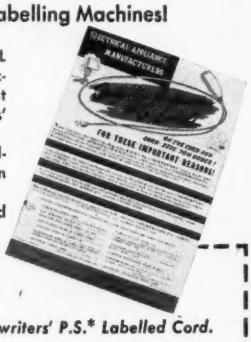

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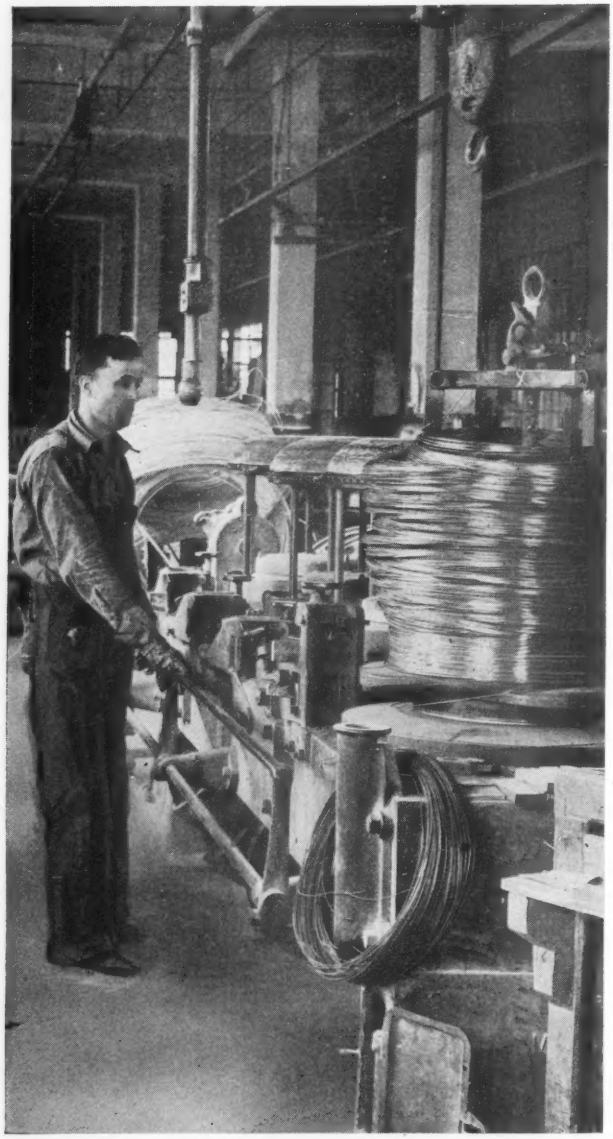

IT isn't the elimination of the actual cost of liming and baking alone that cuts costs. There are many other definite improvements that are obtained when Magnus Metal Coat #267 is used.

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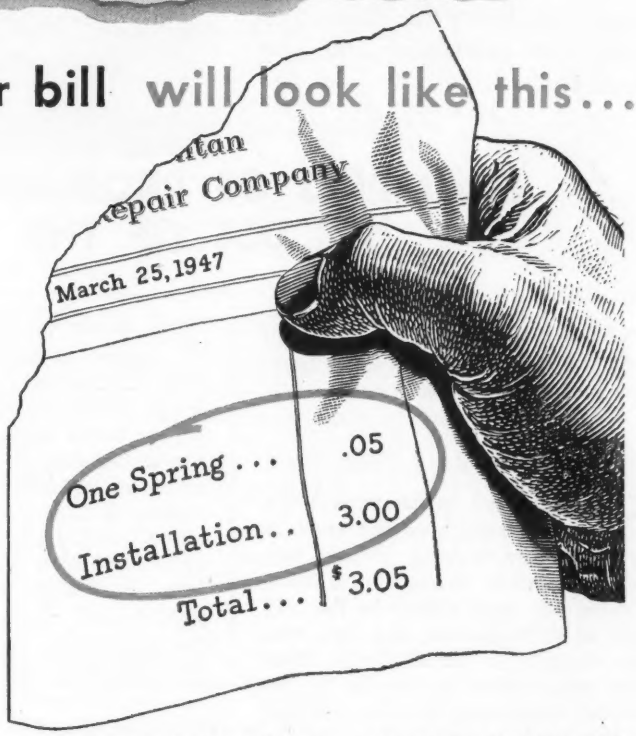

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Provides answers simply and accurately for a given mathematical wire drafting problem. One setting shows number of holes, percentage of draft per hole, total reduction in area and intermediate die sizes to be used. Universality: Because of the circular scale there are neither upper nor lower limits on the diameters that the calculator can be used for.

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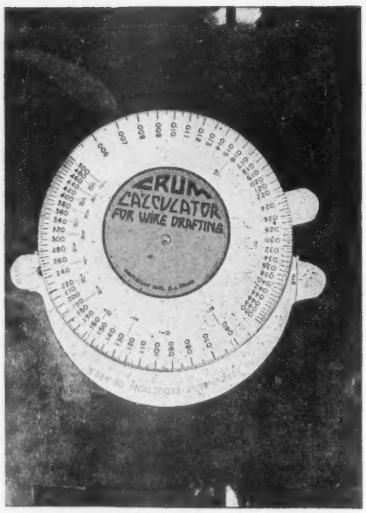

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* * *

The calculator can be used for drawing round copper or any other metal wire.

EXAMPLES OF PROBLEMS SOLVED QUICKLY BY USE OF THE CALCULATOR

PROBLEM No. 1

DETERMINE the reduction of area in drawing ¼-inch diameter rod to .120 inch wire.

PROBLEM No. 2

SUPPOSE that in Example 1 the tensile strength of the stock is such that the drawing process produces a tensile strength of 100,000 pounds per square inch in the .120 inch wire. To develop the same tensile strength in an .080 inch diameter wire, what stock size is required when the tensile strength of the stock is assumed to be the same as that in Example 1.

PROBLEM No. 3

IN the drafting of .0625 inch diameter wire to .025 inch, no single draft must exceed 21 per cent. Determine the minimum number of holes for this job.

* * *

THE Crum calculator is designed especially for wire drawing jobs involving eight or fewer drafts. Problems involving a greater number of drafts can be solved, however, with extra manipulation. For instance, if it is desired to set up a multi-draft machine to draw .0095 inch diameter wire from .0625 inch stock in sixteen drafts, the intermediate die sizes can be determined by the calculator.

PROBLEM No. 4

A CERTAIN five-block continuous wire drawing machine has a capacity permitting a draft of 33 per cent per hole on low carbon wire. For economic reasons it is desired to find the largest stock size that can be used when finishing .0455 inch diameter wire on this machine.

* * *

PROBLEM No. 5

A continuous machine is to be set up to draw .0375 inch tire bead wire six holes from .122 inch diameter stock. All drafts are to be equal in percentage reduction of area. Determine "a" the intermediate die diameters; "b" the per cent reduction of area per hole; "c" the total per cent reduction of area from start to finish.

PROBLEM No. 6

THE diameter of the finishing block of a double-deck wire drawing machine is twenty-four inches; the diameter of the first block, seventeen inches. The operator wishes to finish .142 inch diameter wire from No. 5 rod and therefore must determine (a) the minimum draft for the finished die, (b) the minimum first die size, (c) and the first die size when a slippage of ten per cent is allowed.

* * *

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The Wire Outlook

Signs for the balance of the year are confused. Consumer spending is off, but intormed opinion is that at least three months of record-breaking business can be expected, barring major work stoppage. Experts hold differing views on the probability and depth of the coming recession, but it is our opinion that it will be more in the nature of a readjustment, rather than a serious depression, with a falling off of perhaps no more than from 10% to 15% in general business.

Steel prices continue to be revised upward, in the face of a demand and a tendency for a reduction. High wages and inefficient production are large factors. One machinery manufacturer recently introduced an incentive pay system and increased his output by 40%, indicative of what labor can do if it will. Consumer durable goods production is on the rise, inventories are being kept low and prices will tend to fall or rise as adjustments are possible or desirable in different lines. Sound labor laws and tax reductions would contribute much to our future stability.

Among the non-ferrous wire mills, a number of concerns report that the buyers' market is now here. Their customers have good stocks and are becoming fussy about prices and specifications. Cancellations of orders have been heavy, reducing backlogs of orders to four or five months delivery. These are cancellations of the duplicated orders that everyone has been carrying.

The copper shortage is partly attributable to the low production of 1946. The removal of the excise tax will help our electric wire industry, but not bring supply into balance with demand in this country, in spite of the fact that there will be a world surplus of some 300,000 tons this year. Distribution, without the benefit of government agencies, would assist in making more copper available where needed.

Lead presents a more serious shortage problem. Of the heavy consumption metals, it is most serious and is destined to remain in short supply beyond 1947.

Our supply of tin is something we are almost entirely dependent upon from foreign sources. For the past five years conditions surrounding its production have not been favorable. The shortage is world-wide and about 70% of what it was in 1941. The supply is expected to gradually improve, but not be normal until 1948 or even 1949.

The supply of steel wire remains restricted by the shortage of rods, but new demand for wire has slowed down. Some of this slackening is occasioned by other parts shortages, as in the case of bed spring manufacturers, basket fabricators, etc. Fine wire sizes for fasteners remain tight. The seasonal demand for fencing and nails has again created an acute lack of wire for these products. Buyers are beginning to insist on getting the quality of steel wire ordered and in some instances are refusing to buy at the new higher prices. Most bolt, nut and river manufacturers could operate at higher capacities if more rod stock were available.

Whereas earlier this year, it was expected that steel would not be in balance with demand until the end of the year, there are many who now predict that continued uninterrupted production will bring this into adjustment by early Fall. The time for real sales effort approaches and those who are wise have already gared themselves for it.

A better understanding between management and labor, possible only when our one-sided labor laws are eliminated, will establish a sounder basis of prosperity. Congress and the Administration have dilly-dallied and played politics as usual, but it is hoped that the telephone strike and the latest coal maneuver will supply the impetus needed to secure anti-monopolistic labor curbs.

—from the Editor's Desk

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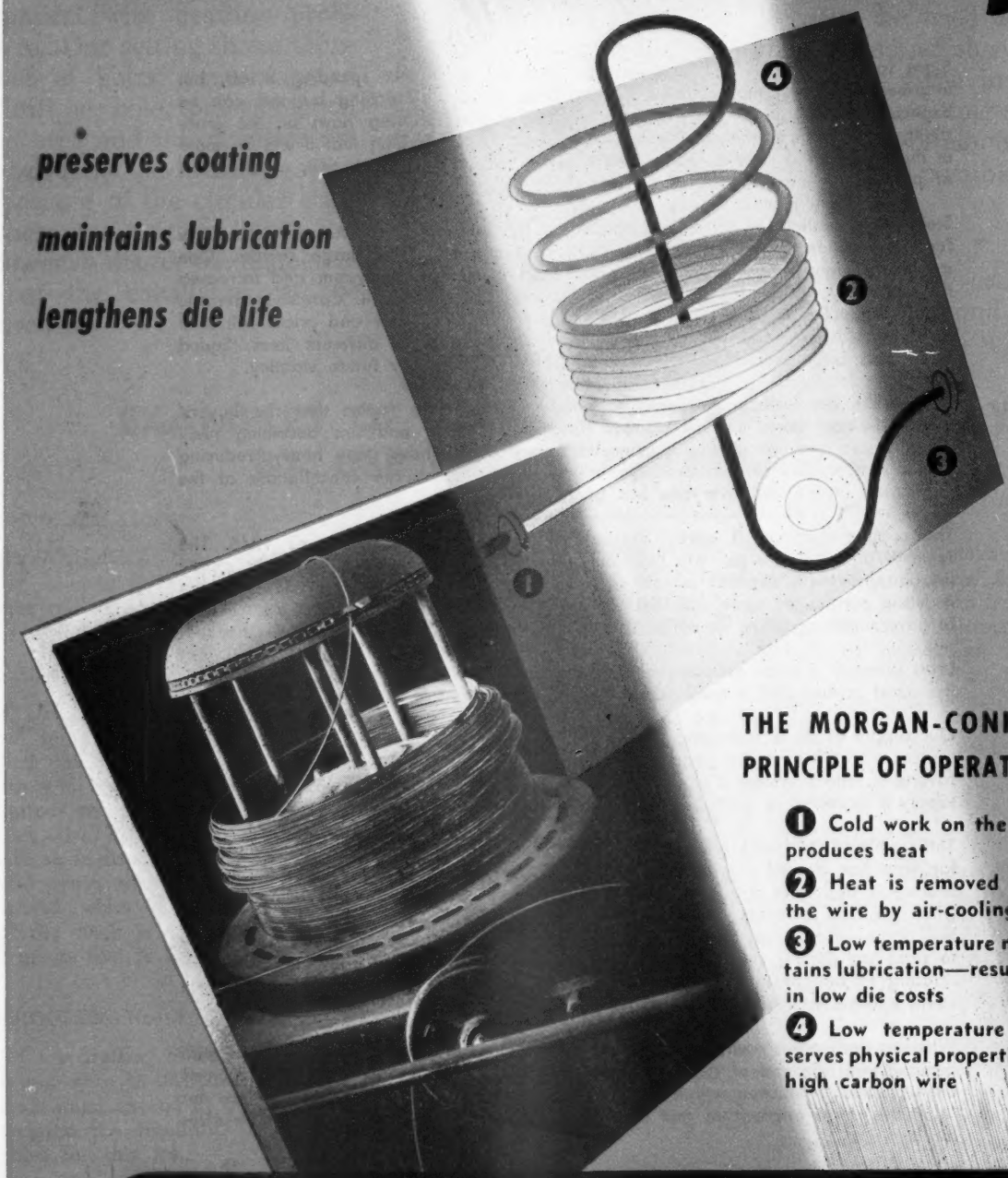

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Vol. 22 MAY, 1947 No. 5

Designated as
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Contents

Editorial Page 347

Electroplating and Cathodic Pickling As Causes of Hydrogen Embrittlement by Dr. Carl A. Zapffe and Eleanor Haslem 351

A Guide to Work Simplification by Malcolm H. Gotterer 358

Continental at Kokomo by Kenneth B. Lewis 360

Labor Relations by John B. Stone 364

Government Wire Production Information 369

Outstanding Personalities of the Wire Industry 371

A Review of Recent Wire Patents 374

Index to Advertisers 392

Where-to-Buy 393-396

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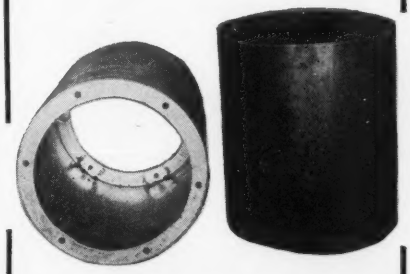

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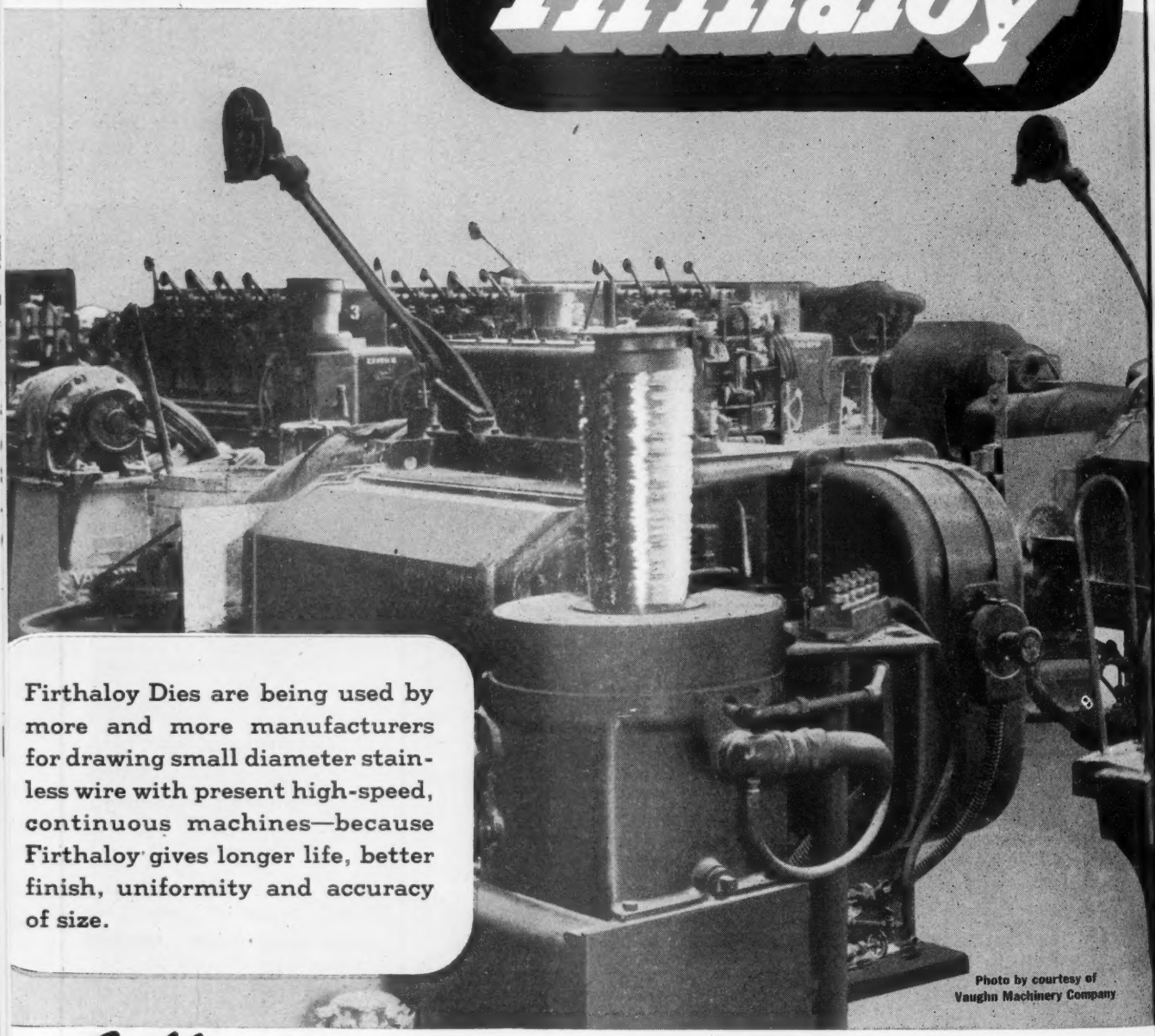

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Vol. 22 MAY, 1947 No. 5

Electroplating and Cathodic Pickling as Causes of Hydrogen Embrittlement

by Carl A. Zapffe, Consulting Metallurgist
and M. Eleanor Haslem, Research Chemist,
Laboratory of the Senior Author
Baltimore, Maryland

Introduction

MUCH misunderstood is the injury done to steel by hydrogen. This follows from the fact that the alloying element here is customarily gaseous and therefore difficult to control and observe, but particularly from the fact that several concepts are popular which are erroneous to the point of being opposite to the truth.

* * *

IN a previous issue of this Journal[1], the fundamental nature of hydrogen in steel was discussed, developing the principles by which hydrogen forms trapped pockets of gas within the metal under great pressure to cause defects ranging from large-scale phenomena of blistering and poor adherence of coatings down to the microscopic phenomenon of embrittlement. It was explained that the atomic lattice of iron acts as a diaphragm which allows tiny hydrogen atoms to enter during pickling or plating, but which prevents these same atoms from continuing through if they ever meet an opening in that lattice-work which is large enough to permit two of them to pair off and form molecular H_2, the stable gaseous form.

In this paper there is presented:

1. A new bend test, easy to construct and operate and especially suited to measuring brittleness in wire specimens;
2. Demonstration of the effect of pickling time and temperature of the bath on the hydrogen embrittlement resulting from cathodic pickling;
3. Proof that hydrogen absorption during cathodic pickling is identical for either alkaline or acid electrolytes;
4. Demonstration of the effect of certain bath impurities, particularly arsenic and sulfur, on increasing hydrogen embrittlement during cathodic pickling;
5. A quantitative evaluation of the embrittlement caused by chromium plating, which greatly exceeds that caused by 100 per cent hydrogen plating;
6. A quantitative evaluation of the embrittlement caused by cadmium plating, which, though codepositing only a small proportion of hydrogen, causes hydrogen embrittlement equal to and even exceeding that caused by the 100 per cent hydrogen plating of cathodic pickling.

* * *

SINCE electrochemical action, as in cathodic pickling or electroplating, is a powerful agent in developing and presenting the soluble individual hydrogen atoms to a cathode surface, electrochemical processes incur liability of the cathode to hydrogen-caused defects.

A Sensitive Test for Embrittlement

BY definition, hydrogen embrittlement is a condition of low ductility. Its degree is consequently reflected in values for elongation, reduction of area, angle of bend, and such operations as cold-heading and upsetting — in brief, wherever ductile flow is required.

* * *

COLD-WORKING removes hydrogen from steel; and any test for hydrogen embrittlement must take into account the fact that the damaging gas is being lost during the course of the test. With the bend test, for example, a film of oil placed on the specimen will readily demonstrate that hydrogen diffuses from the convex side during bending. As a conse-

quence, a reverse-bend or cyclic fatigue test measures partly recovered metal. Prolonging the test also obscures the data, for the metal is recovering during testing.

* * *

AS a compromise between the necessary plastic movement during testing and the concurrent hydrogen loss, a constant-rate single-bend test has been developed[2]. The testing machine is illustrated in Figure 1. A synchronous motor (A), with a gear-reduction ratio of 600:1 draws a cord which extends from pulley B, around the periphery C of the instrument base, to a hook on a traveling arm D. This arm swings about a 1/8-inch pin at E which serves as the bending radius. Arm D is drilled alongside E so that a 1/16-inch wire specimen can be inserted into the arm 1 inch. This traveling arm then swings at a constant speed of 5°/sec. for 180° around the base, bending the wire around radius E. If the wire breaks, the angle of bend is recorded as a measure of the embrittlement.

* * *

WHEN care is taken to control the numerous and subtle factors which affect hydrogen embrittlement, reproducible data are obtained which reveal many things previously unknown.

* * *

Experimental Procedure

ANNEALED Type 440-C stainless steel wire (17% chromium —1% carbon) was selected for study because this grade is typically susceptible to hydrogen. Many plant failures in handling this steel can be traced to hydrogen, ranging from coil breakage in the wire mill to splitting during cold-heading operations. The wire, .062-inch in diameter, had the following composition:

Chromium	**17.46%**	**Silicon**	**.48%**
Carbon	**1.01**	**Phosphorus**	**.021**
Nickel	**.50**	**Sulfur**	**.024**
Manganese	**.34**		

Its hardness was 112 Rockwell F; its tensile strength 115,000psi.

* * *

IN all tests, a 4-inch length of wire was uniformly cleaned by longitudinal abrasion with 120-grit emery paper, for surface condition itself is a variable factor[2]. Care was taken not to cold-work the wire by bending before testing, because cold-work is another variable[3,4]. Duplicate specimens were used, each immersed two inches in the test solution. At the conclusion of the test, the two specimens were uniformly rinsed and transferred immediately to a bath of ice water to arrest spontaneous recovery. In 30 seconds the first wire was tested; in 90 seconds the duplicate. This control stems from the observation that in some cases enough hydrogen leaves the wire in 90 seconds to affect materially the bend value.

* * *

Cathodic Pickling Effect of Pickling Time and Temperature

CATHODIC pickling holds practical interest for some operations in which cathodic cleaning is used; and general interest attaches to a comparison of this "hydrogen plating" with certain electroplating processes which include a proportion of "hydrogen plating" as a measure of their inefficiency[5].

* * *

FIGURE 2 shows the progress of hydrogen embrittlement with pickling time when the wire is made

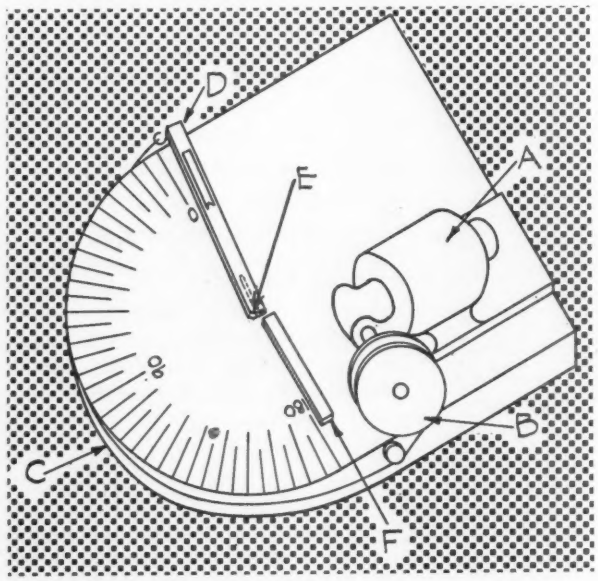


Figure 1
Sketch of constant-rate single-bend test for measuring hydrogen embrittlement in steel wire. D is a traveling arm motivated by a cord which passes around the base C from pulley B on motor A. At E on the traveling arm a slot is cut to receive one end of the wire specimen; and the mouth of the slot is a machined 1/8-in./radius about which the wire bends as arm D travels. At the other end of arm D an arrowed slot allows reading of the angle at which the specimen breaks. F is a fixed arm which backs up the free end of the wire.

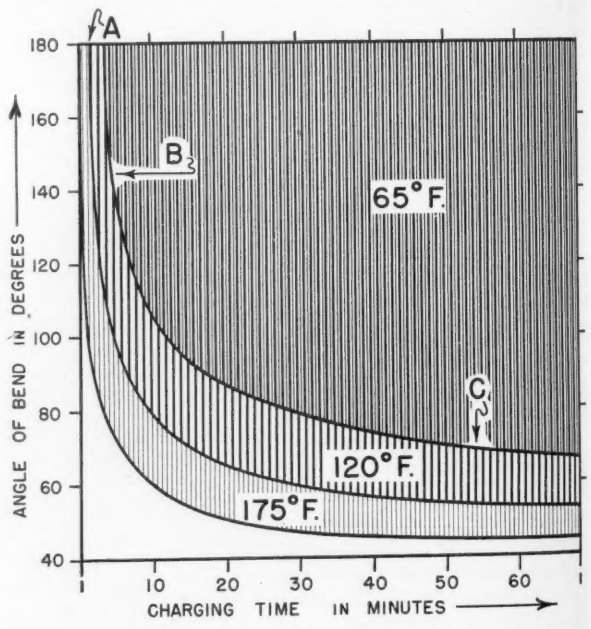


Figure 2
Effect of pickling time and temperature on hydrogen embrittlement from cathodic pickling, as determined by the constant-rate single-bend test. The upper boundary of the graph is the 180-degree bend line for ductile metal. Cathodically pickled in 10% NaOH at a current density of 1 amp/in.^{2}, the wire suffered embrittlement measured by the upper shaded area when the pickling temperature was 18°C. (65°F.). Raising the pickling temperature to 50°C. (120°F.) and then to 80°C. (175°F.) caused additional embrittlement as designated by the two lower shaded areas. (See text for discussion of ranges A, B, and C.)

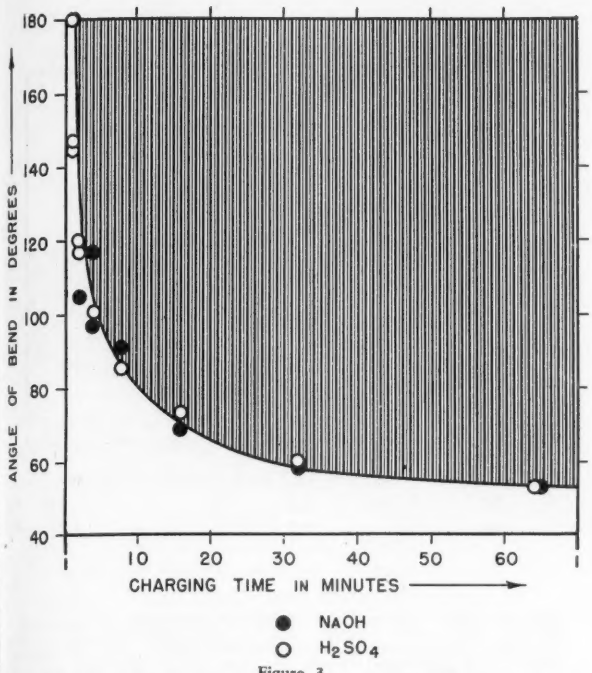


Figure 3

Superimposed embrittlement curves proving that electrolytic pickling in either alkaline or acid solutions provides identical hydrogen absorption, other factors being constant. With current density constant at 1.0 amp./in.^{2} and pickling temperature fixed at 50°C. (120°F.), the embrittlement curves for acid and for alkaline electrolytes are identical within experimental error and are so depicted as a single curve enclosing a single embrittlement area.

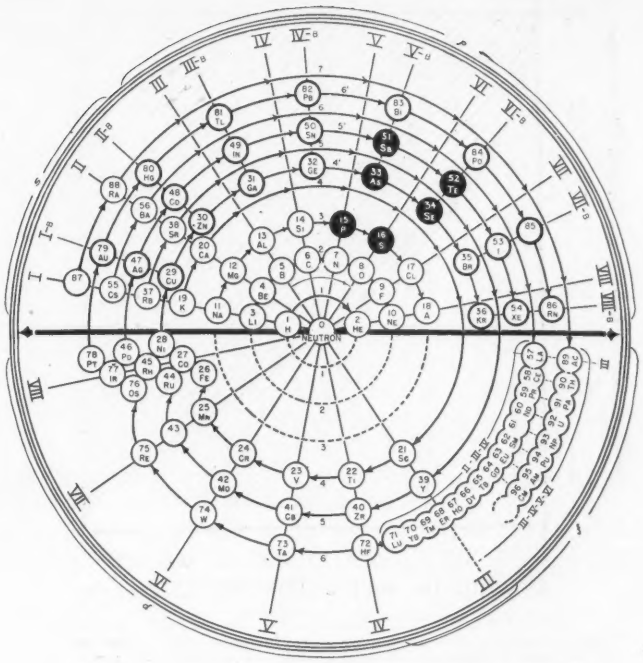


Figure 4

Periodic chart of the elements showing the pattern of those elements (in black) which "promote" the absorption of hydrogen by steel during pickling. Note that they lie only on Radii V-B and VI-B; that the elements at either end of the radii are excluded; and that the pattern includes such common impurities in steel (and therefore in used pickling liquors) as sulfur and phosphorous [7]

cathode in 10% NaOH solution at a fixed current density of 1.0 amp./in.^{2}. There is an interval "A", which can be called the "incubation period" because hydrogen is being absorbed, but without measurable embrittlement using the present machine with its bend ratio of d/2d for wire/axle.

* * *

SUDDENLY range "B" appears in which the bend angle drops precipitously. Then a further slower defection, range "C", sets in. According to the explanation developed previously in great detail[1], it is assumed that in range "A" the hydrogen atoms are penetrating the lattice of the cathode and beginning the process of precipitating as H_2 molecules in mosaic voids; in range "B" the pressure of the trapped gas suddenly exceeds the cohesive strength of the crystalline units within the steel and starts an epidemic of brittleness; and in range "C" the embrittlement is worsened, but only slightly because the bulk of the damage has been done in range "B".

AN effect of pickling temperature also appears in Figure 2. At higher temperatures the incubation range "A" is considerably shortened, and all subsequent bend values are proportionately lower for any given pickling time.

Alkaline vs. Acid Electrolytes

OCCASIONALLY there is heard the statement that hydrogen may be absorbed from an acid electrolyte, but not from an alkaline electrolyte. This is absurdly incorrect, for the electric currrent

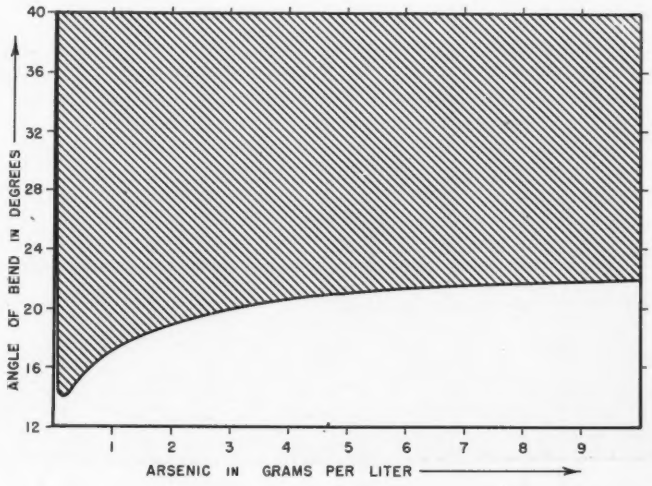


Figure 5

Effect of arsenic in the electrolyte on embrittlement during cathodic pickling. Wires pickled cathodically for 15 minutes at 77°C. (170°F.) and 1.0 amp./in.^{2} in 10% sulfuric acid broke at 40 degrees of bend, which is the "blank" for the test and is the upper boundary in the figure The shaded area bounded by the curve measures the additional embrittlement caused by arsenic added to the electrolyte. * * * * * *

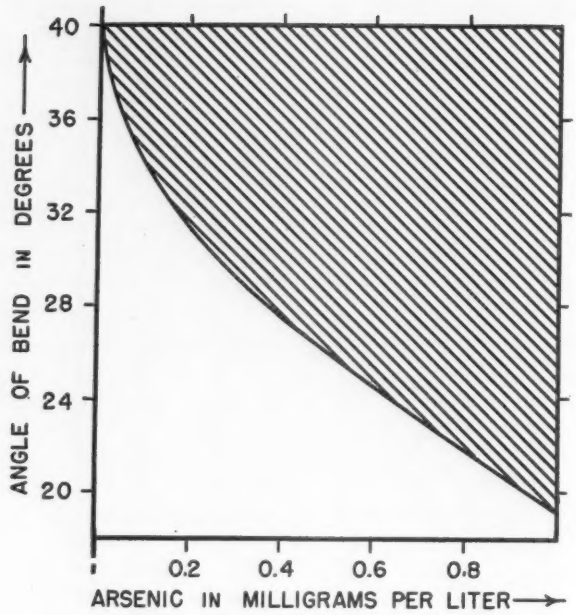


Figure 6

Detail of the first part of the previous curve for arsenic additions of less than 1 milligram. Note that only 0.1 milligram of arsenic caused a drop of six degrees in bend value.

* * *

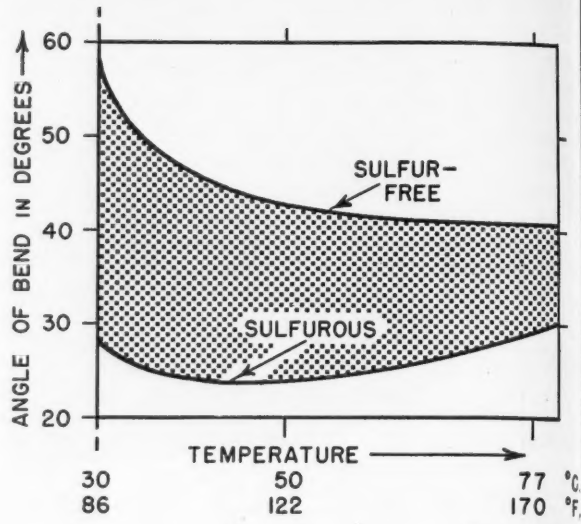


Figure 7

Effect of sulfur dissolved in the bath. The standard bath described in Figure 5 (no arsenic added) caused embrittlement at various pickling temperatures as shown by the upper curve. Duplicate tests with hydrogen sulfide (H_2S) bubbled through the bath led to the lower curve, the shaded area measuring the additional embrittlement resulting from the presence of dissolved sulfur (sulfide ion).

transfers hydrogen atoms to the cathode in much the same manner for all conducting aqueous solutions which do not plate out other components. This includes acid electrolytes, alkaline electrolytes, and salt solutions.

In Figure 3 the bend values resulting from cathodizing in 10% sodium hydroxide (NaOH) are seen to be identical with those obtained from duplicate tests in 10% sulfuric acid (H_2SO_4).

* * *

"Promoters"

Arsenic

OVER twenty years ago it was observed that minute traces of certain elements in the pickling bath greatly increase the amount of hydrogen absorbed by a steel cathode[6]. Especially interesting is the fact that all elements having that effect stand closely together on a periodic chart, such as that shown in Figure 4[7].

* * *

ARSENIC is one of these "promoters", its presence enabling an increase in hydrogen absorption of a hundredfold[8]. Figures 5 and 6 illustrate the great effect of arsenic as reflected in bend values. Only 0.1 milligram in one liter of electrolyte measurably depressed the bend values.

* * *

ONE-TENTH of a gram reduces the bend value from 40 degrees in a normal test to only 14 degrees, a condition of brittleness comparable to that of glass. It is also interesting that at greater concentrations the effect lessens, though never regaining the value for an arsenic-free solution.

* * *

Sulfur

SINCE one of the elements — sulfur — in the "promoter" group is a common component of steel which may enter the pickling bath during the dissolving of metal and scale, it deserves attention. Ac-

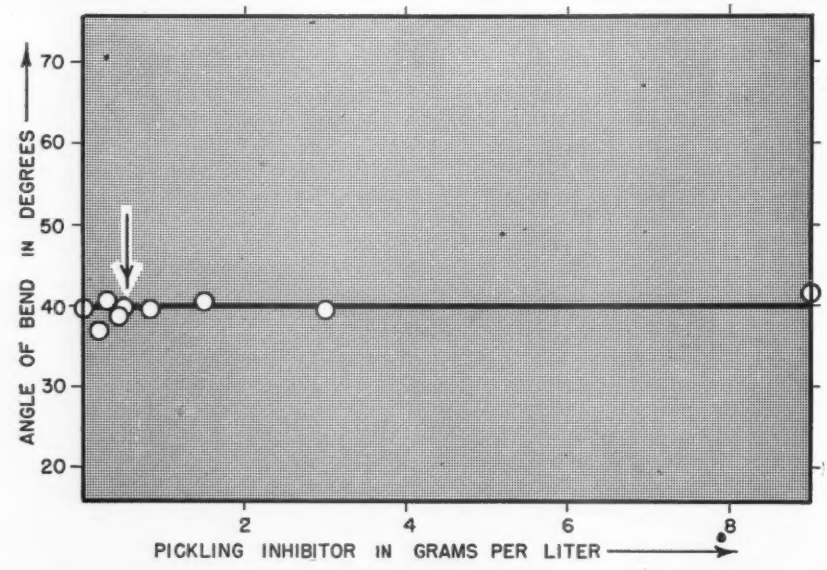


Figure 8

Effect of the commercial pickling inhibitor, Acitrol Liquid, on hydrogen embrittlement during cathodic pickling. This reagent, designed specifically for chemical pickling, presumably plates out on the metal surface and thereby inhibits further acid attack. If it behaved similarly in this typical pickling acid (10% sulfuric acid) under the conditions of electrolysis described in Figure 5, hydrogen absorption should be impeded and embrittlement "inhibited". The graph shows no such effect. (Arrow designates proprietary addition for chemical pickling.)

cordingly, hydrogen sulfide gas (H_2S) was bubbled through the standard bath described in the caption of Figure 5. Tests run at three different temperatures in sulfurous and in sulfur-free baths provided the results shown in Figure 7. The shaded area measures the added defection caused by the sulfur in the electrolyte. The upbending of the lower curve at higher temperatures is probably a result of the fact that less H_2S dissolves as the temperature rises. Sulfur added another way, as by the leaching of sulfur-containing steel, might well lead to greater injury than shown by this test.

* * *

THIS observation is significant because defects caused by hydrogen in the plant can often be traced back to the use of old pickling liquors. The difference between old and fresh liquors may well lie in their content of "promoter elements".

* * *

"Inhibitors"

ALTHOUGH pickling inhibitors are designed specifically for chemical pickling, rather than electrolytic, some interest attaches to their possible effect in electrolysis. In chemical (acid) pickling, the molecules of inhibitor presumably attach to the metal surface when it becomes exposed, preventing further attack. If such an action also occurs in cathode pickling, one might expect the absorption of hydrogen to be inhibited likewise.

* * *

TWO common commercial inhibitors, Acitrol Liquid* and Rodine ** were accordingly added to 10% sulfuric acid (H_2SO_4) electrolytes and tested over a wide range of concentrations which included the proprietary additions for chemical pickling. Figure 8 shows that Acitrol Liquid has no effect on the embrittlement resulting from cathodic pickling.

* * *

IN Figure 9, however, we have the surprising result that Rodine **increases** embrittlement. The proprietary addition for chemical pickling, marked with an arrow on the graph, lies some 10 degrees below the blank value; and further additions of Rodine cause still greater embrittlement.

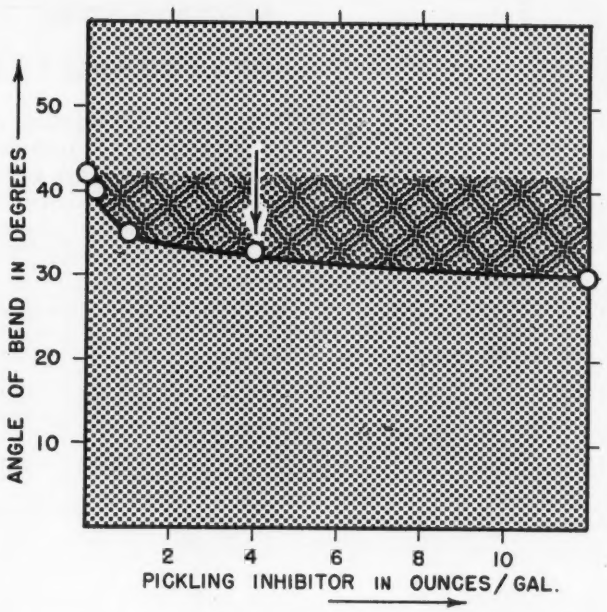


Figure 9
Effect of commercial pickling inhibitor Rodine on hydrogen embrittlement during cathodic pickling. In surprising contrast to expectation and to the behavior of the inhibitor in the previous figure, Rodine increases hydrogen embrittlement when added to sulfuric acid used for cathodic pickling. The proprietary addition, marked by an arrow, lowers the bend value 10 degrees; and greater additions decrease it further. This substance therefore shows "promoter" action, rather than inhibitor action, and increases embrittlement beyond that caused by 100% hydrogen plating. The heavily shaded area measures the added defection caused by Rodine

SINCE this is an evidence of "promoter" action, the phenomenon possibly relates to a promoter element contained in the composition of Rodine. Certainly there is no "inhibiting" action

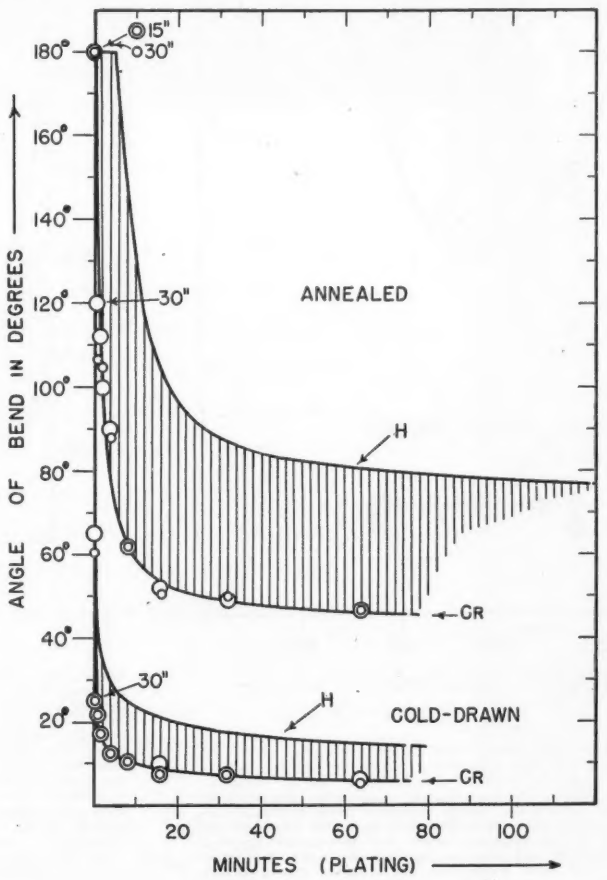


Figure 10
Embrittlement of stainless steel 440-C wire (17% chromium — 1% carbon) in the annealed and the cold-drawn conditions after electroplating with chromium. Curves for straight cathodic pickling, marked "H", are included for comparison. The shaded areas therefore represent the decease in ductility effected by chromium plating beyond that caused by cathodic pickling at the same temperature and current density. (Small circles are duplicate specimens) * * * * * * *

* E. F. Houghton Co.
** American Chemical Paint Co.

whatsoever, as far as hydrogen embrittlement is concerned.

* * *

THE matter is sufficiently interesting to warrant separate discussion, for a question immediately arises concerning the action of such products in the chemical pickling for which they are designed. Many plant experiences with inhibited acids are sufficiently inconsistent with the popular understanding of inhibitors to arouse one's curiosity. That discussion, however, will be reserved for another paper.

ELECTROPLATING

Chromium Plating

OF the many electroplating processes known to include a proportion of hydrogen plating, chromium plating is outstanding. In fact, rarely does the efficiency of chromium plating exceed 15 per cent, the remaining 85 per cent of the electrical energy being consumed in depositing hydrogen on the cathode. One might therefore expect embrittlement from chromium plating possibly 85 per cent as severe as that from straight hydrogen plating. However, because chromium is known to be relatively impermeable to hydrogen, one might revise his estimate to somewhat lesser defection, because a growing chromium coating would tend to become protective.

* * *

TO the decided contrary, the following experiments prove that the hydrogen embrittlement resulting from chromium plating is **much worse** than that caused by 100% hydrogen plating. Though the data are surprising, they are consistent with the known liability of chromium-plated steel to hydrogen embrittlement.

(*Please turn to page* 379)

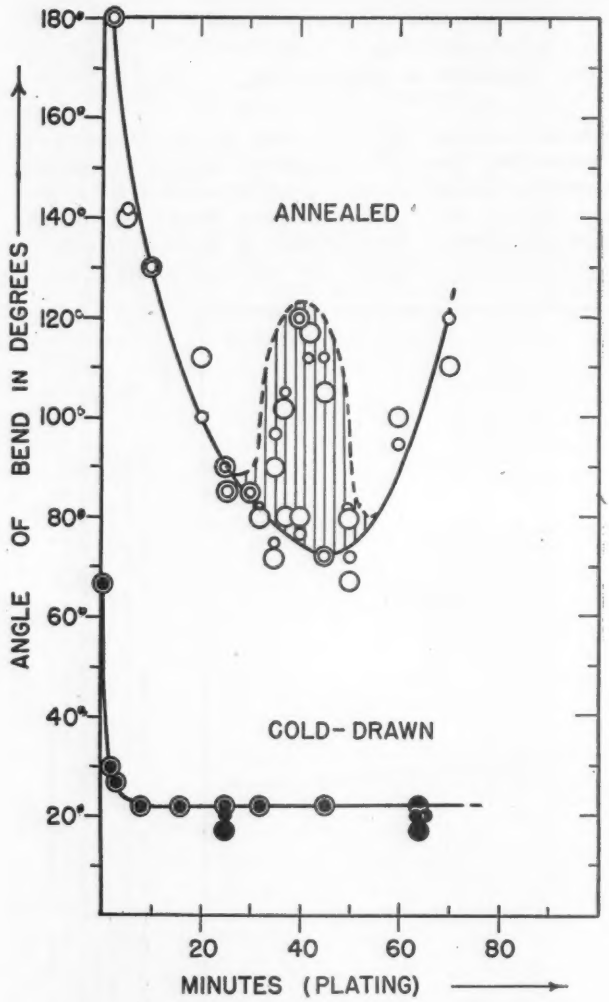


Figure 11

Embrittlement of stainless steel 440-C wire (17% chromium — 1% carbon) in the annealed and the cold-drawn conditions during electroplating with cadmium. Surprisingly severe embrittlement sets in abruptly, but declines as the plate thickens, since cadmium is relatively impermeable to hydrogen. A plating period is finally reached beyond which the specimen recovers regardless of continuing plating. This spontaneous recovery expresses itself as the indecisive zone and subsequent upswing in the curve for the annealed wire, and as the lack of further embrittlement in the cold-drawn wire after plating for ten minutes. (Small circles area duplicate specimens.) * * * * * *

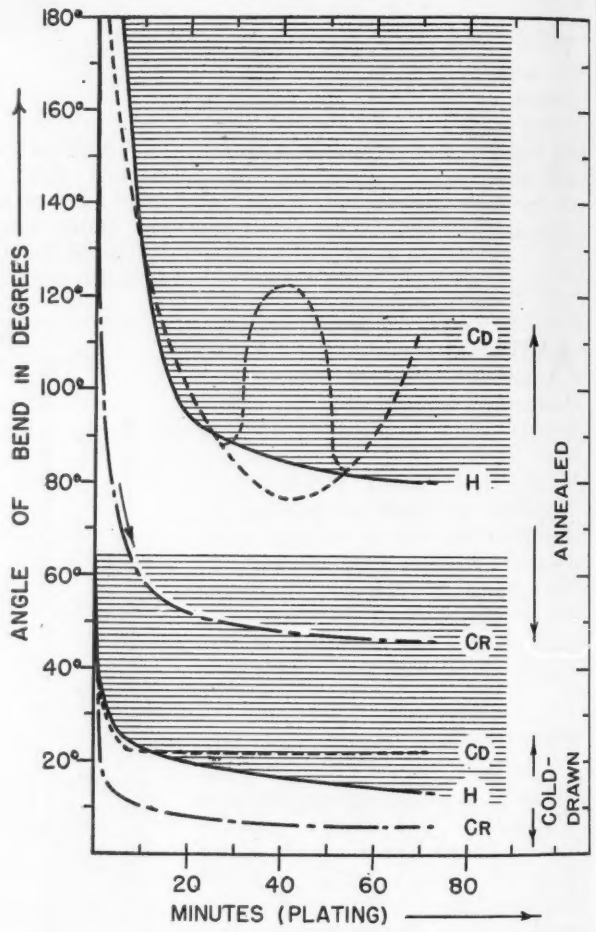


Figure 12

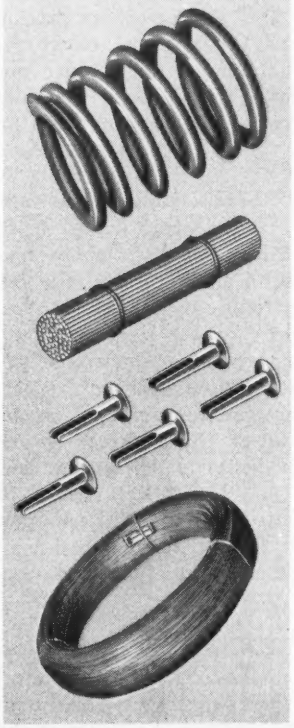
Master plot comparing the embrittlement of stainless steel 440-C wire resulting from electroplating with chromium, with cadmium, and with hydrogen (cathodic pickling), respectively. The two curve groups, "annealed" and "cold-drawn", show the much greater sensitivity of the cold-drawn steel and the extremely low bend values caused by chromium plating, in particular. The area of embrittlement caused by hydrogen plating is shaded in each case to serve as a standard for judging the other curves. By comparing the three curves within each group, one sees that both cadmium and chromium plating cause more damage in early plating periods than 100% hydrogen plating for the same period. Over long plating periods, cadmium-plated articles improve relatively. In order of increasing damage to ductility as expressed in bend values, one can rate these processes as: (1) Hydrogen plating (cathodic pickling), (2) Cadmium plating, and (3) Chromium plating. Note how the curve for chromium-plated annealed steel invades the embrittlement zone of cold-drawn steel. * * *

SKILLED MEN AND ELECTRIC EYE OPERATE BESSEMERS AT J&L TO PRODUCE CONTROLLED QUALITY WIRE PRODUCTS

J&L STEEL

Ease of fabrication in making your products of wire results in better looking items. They will sell quicker and stay sold. Your costs will reflect the time you save in your operations, too.

To produce the kind of wire you want, J&L carefully controls each step in its steel making process. For instance, the electric eye was applied by its research metallurgists to regulate the operation of J&L Bessemer converters. In the hands of skilled men together with other control methods it has been the means of producing J&L Controlled Quality wire products with the excellent physical properties that are so desirable to the fabricator.



SPRING WIRE · ARC WELDING WIRE · FORMING WIRE · LOCK WASHER WIRE
CHAIN WIRE · TUBULAR AND BIFURCATED RIVET WIRE
WOOD SCREW AND MACHINE SCREW WIRE · GALVANIZED WIRE

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PA.

A Guide to Work Simplification

by Malcolm H. Gotterer, Ind. Engr.

Kay Manufacturing Corporation
Brooklyn, N. Y.

Work simplification is especially suited to the needs of foremen and supervisors. The short period of time spent learning the basic principles will be repaid many times in the increased production at lower costs.

HIGH production is the corner stone of American Industry. Our nation has grown as industry grew. And the future development of industry depends upon achieving the fullest utilization of men, material and machinery.

* * *

SINCE the days of Taylor many men and women have striven to develop ways to make our daily tasks easier and simpler, and to produce a better product at lower cost. It was not their aim to reach this goal merely by increasing the quantity of work a man does. Instead, they based their work upon the scientific principles of motion economy. That is, the reduction of unnecessary, wasteful and fatiguing movements made while doing a job. Thus was developed a technique which enables us to increase the individual workers productivity, lower the physical effort required to do the job and reduce manufacturing costs. This technique is known as work simplification.

* * *

FOREMEN and supervisors have found work simplification especially suited to their needs. It enables them to find the one best way to do any job. Many erroneously believe work simplification to be a complicated device only to be used by men with highly specialized engineering training. The truth is quite to the contrary—work simplification can be learned and used by all. The short period of time spent learning its basic principles will be repaid many times in increased production at lower costs.

* * *

THESE savings can be achieved only by maintaining the proper mental attitude toward changes. The following suggestions will be of help:

1. **MAINTAIN AN OPEN MIND: Because a job has been done one way for five, ten or fifteen years does not mean that it is the correct way. In fact, it is almost a certain indication that it is a time-consuming and wasteful operation.**
2. **DEVELOP A QUESTIONING ATTITUDE: It is only by constantly asking "Why?" that you will receive the full benefits of work simplification.**
3. **GET TO THE CAUSE OF THE TROUBLE: Make it a point to get to the roots of the trouble instead of its effects. Ask yourself, "Why does this trouble exist?" rather than, "How can I solve this problem with the least amount of effort?"**
4. **INVITE CRITICISM: Every time a suggestion or idea of yours is criticized you must analyze that criticism into its constructive and destructive parts. Much can be learned from the constructive criticism; look at it carefully and make the most of it. The destructive criticism should be rejected with the thought that every knock is a boost.**

* * *

Making the Analysis

THE work simplification analysis consists of five basic steps. Each of these steps forms a part of the orderly approach to work simplification. For best results it is necessary to follow the steps in the order indicated:

1. **Select the job.**
2. **Break the job down.**
3. **Question the details.**
4. **Develop the new method.**
5. **Install the new method.**

Each of these steps will be discussed in detail.

* * *

Selecting the Job

THE selection of the job to be studied is an important part of the analysis. It can readily be seen that there is no advantage in spending your time and effort improving a job that will soon be discontinued.

* * *

IT is a good plan to look first for the repetitive jobs that are the backbone of a department. Or, if a "bottleneck" exists, tackle that job first. That troublesome job that is giving you gray hair may be a good place to start. Or perhaps there is one that you think is wasteful in time and material.

* * *

DECIDE just which job can give you the best returns in savings of labor, material and time. Then get all the available information about it — such as blue prints, models, operation sheets, etc. Study this information and get familiar with the way the job is being performed. Remember, first things first.

* * *

Breaking the Job Down

IN order to visualize the job as a series of small movements, the job is broken down. Work simplification depends upon the care with which this step is taken.

THE breakdown is made in the form of an operation chart. Such a chart is shown in Fig. 1. The chart is divided into two parts. At the top is the information section. This is to acquaint anyone with the job as it gives all the data necessary for the understanding of the chart. This section should include the following items:

1. **Name of the part.**
2. **Number of the part.**
3. **Operation (What is being done to the part)**
4. **Department in which the work is done.**
5. **Your name.**
6. **Machine or fixture number.**
7. **Description of the machine or fixture.**

* * *

THE second part of the chart is the description of what has happened to the part during the operation. It will be noted in Fig. 1 that a short description of what has happened to the part is preceded by a symbol. These symbols are as follows:

1. **Operation — ○**

ANY time any work is done on a piece of material it is called an operation and designated by a large circle.

2. **Transportation — ○**

WHENEVER the work is moved from one place to another, whether by hand, machine or conveyor, it is called a transportation and designated by the small circle. The distance that it is moved follows the symbol.

3. **Storage — △**

IF at any time, the work is put aside for future use or is waiting for something to be done to it, it is said to be in storage and is designated by the triangle.

4. **Inspection — □**

ANY time the work is inspected physically, mechanicaly or visually it is said to be an inspection and designated by the square.

* * *

WHEN observing the job, record each element as it occurs. Thus, when you are finished, there is a complete picture of what has happened to the piece of material in the form of the chart. While observing the job, be sure to record the elements in the correct order. A short concise statement describing the operation that has occurred should also be recorded. See Fig. 1.

* * *

Question the Details

AT this time, the questioning attitude discussed earlier must be applied. Take each element on the operation chart separately and ask these questions:

1. **WHY is this element necessary?**
2. **WHAT is the purpose of this element?**
3. **WHERE is the best place to do this?**
4. **WHEN is the best time to do it?**
5. **WHO is the best qualified to do it?**
6. **HOW is the best way to do it?**

IT is of extreme importance to get factual answers and not just opinion as answers to these questions. Do not accept answers which do not fully explain and justify the present method. Dig down and get the basic facts.

* * *

ALSO question the following items:

1. **Material (size, price, availability, substitution).**
2. **Machinery (capacity, conditions, servicing best for job).**
3. **Tools (proper tools available, jigs, fixtures, quages)**

(Please turn to page 382)

OPERATION CHART

STUDY NO. 215

PART ELECTRIC MOTOR — PART NO. IN-86-531 1/4

OPERATION REPLACE ROTOR — DEPT REPAIR (#381)

MACHINE NO. —— — TYPE BENCH

OBSERVER M.H. Gotham — DATE 3/12/47 — CHECKED BY [illegible]

SYMBOLS:- ○ OPERATION □ INSPECTION ▽ STORAGE ○ TRANSPORTATION

DIST FEET	SYMBOL	DESCRIPTION
	▽	MOTOR ON TABLE
	○	PICK UP MOTOR
	□	READ TAG
3'	○	PLACE MOTOR BACK ON TABLE
	▽	GOES FOR SCREW DRIVER
	○	REMOVE SCREW AND CAP
1'	○	PLACE SCREW AND CAP ON TABLE
	○	REMOVE ROTOR
	□	EXAMINE ROTOR
2'	○	PLACE ROTOR ON TABLE
	▽	GO FOR NEW ROTOR
	□	EXAMINE NEW ROTOR
	○	PLACE NEW ROTOR IN CASE
	○	SCREW CAP BACK BACK ON
	▽	RETURN SCREW DRIVER
8'	○	CARRY MOTOR TO TEST BENCH
	○	TEST MOTOR
8'	○	CARRY MOTOR TO THE WORK TABLE
25'	▽	TAKE OLD ROTIR TO STORE ROOM
50'	○	TAKE REPAIRED MOTOR TO INSPECTION DEPT

Continental at Kokomo

By Kenneth B. Lewis

Consulting Wire Mill Engineer,

Worcester, Mass.

An outline of the history and developments of the Continental Steel Corp., of Kokomo, Indiana. The first of a series of articles on the history of American Wire Mills.

IN the eighteen nineties Indiana and Illinois were rapidly getting ripe for a revolution in fencing. Stones in the soil were neither big enough nor numerous enough for wall building. The pioneers' wooden fences had long since rotted out and up-keep was getting more burdensome as timber became scarcer and dearer. Moreover, the stake-and rider and snake fences had definite weaknesses; they spoiled too much ground, shaded too much of the crop, and afforded too many blind angles and corners for the nourishing of undesirable vegetation and vermin.

* * *

WIRE fencing was an old story, of course, but in the form then available it failed to meet the situation. Barbs had been added to the galvanized strand, but while the result was quite all right for range cattle, it did not meet the problems of the more mature farming that was spreading over this area; it wouldn't hold the small stuff, the sheep, hogs, and chickens. There was an insistent demand for field fence, but unfortunately field fence had not yet been invented.

* * *

IN a situation of this sort, inventive genius begins to pop on all sides, and organizing talents follow close behind. Soon the farmers were stringling line wires on posts, and, in small groups, with a coil of wire on a barrow and a hand operated gadget, were actually weaving their field fence in place. It was against this background that the wire enterprise at Kokomo came into being.

IN 1896 **Dr. John E. Fredrick** and two others who dropped out of the association very early, organized, with a capital of $6000, the Kokomo Fence Machine Company, to exploit one of the earliest of these fence weaving gadgets. Besides the fence machines they dealt in ornamental fences and gates. Dr. Fredrick was never one to look the other way when opportunity knocked at the door; we don't know all the circumstances, but within three years the name had become Kokomo Wire & Nail Co., and the capital had become $100,000. A year later wire was being drawn in the new plant, and nails, staples, barbed wire and market wire had been added to the fence weaving machines, in the amount of about fifty tons daily.

RALPH K. CLIFFORD

President Continental Steel Corp., Kokomo, Ind. Past President, The Wire Association.

Mr. Clifford began his career with the Kokomo Steel & Wire Company in 1907. In 1916, after graduating from the University of Michigan, he was named chief chemist at the Kokomo plant and in 1925, general superintendent. In 1937 he became works manager of Continental Steel Corporation at Kokomo and in 1940 he was elected Vice President in Charge of Operations. He became a director of the Corporation in 1941 and a member of the executive committee in 1943. In March, 1944, he was elected Vice President and General Manager of the Corporation, and President, August 1946. * * * * * *

* * *

THIS little company never had time to get used to one corporate name and structure before new letter-heads were coming in. In 1901, within five years of Dr. Fredrick's entry into the field, the capital was two million, the name was Kokomo Steel & Wire Co., the output, in tonnage and character, was that of the standard common products mill of that day, and an eighteen stand Garrett rod mill was keeping pace with the wire mill's demand. About 1903 machines were developed to weave field fence at the mill. The wire mill settled down to a steady jog, relatively undisturbed until the lively decade of 1920-1930, during which wire mills everywhere felt the impact of continuous drawing, carbide dies, straight line cleaning, and the demand for near-by sources of manufacturers' wire.

* * *

DR. Fredrick, as secretary and general manager, was the leading spirit in these advances, and in those to follow, and remained such until his death in 1943, at the age of 78, as Chairman of the

board of Continental Steel Corporation. The early years were not without their problems. During the period 1906 to 1912 the company often was pinched for billets, and at times was forced to import them from Europe to keep in operation. In 1914 they installed two 75-ton basic open-hearth furnaces, a 34" blooming mill to roll steel for the rod mill, and, in 1917, a third open-hearth.

* * *

AT about this time began the association with the Kokomo Steel & Wire Co. of **Ralph K. Clifford,** well known to all members of the WIRE ASSOCIATION in particular and to wire men in general, as an ardent supporter of the Association, a founder, and its second president. A native son of Kokomo, Ralph began the association as a high school boy on vacat ion. continued it as a student at the University of Michigan, and, having taught school two years after his graduation, made a permanent connection as Chief Chemist in 1916. He moved upward steadily for thirty years, and became president last January.

D. A. Williams, Chairman Board of Directors. Continental Steel Corporation.

* * *

IN 1927 **Kokomo Steel & Wire Co.** became **Continental Steel Corp.** by virtue of a merger with Superior Sheet Steel Co. of Canton, Ohio, and Chapman Price Steel Co. of Indianapolis. Very recently Superior has withdrawn from this association. The merger was signalized by the addition of two open-hearth furnaces, a sheet-bar and billet mill, and a sheet mill, all at Kokomo. With 1-3/4" billets available, the old three-high roughing stand of the Garrett mill was replaced by a continuous train. At various periods of rebuilding, the capacity of the steel furnaces was stepped up to an average of 125 tons per heat.

* * *

THE wire mill, which, like most of its type in that period had been relatively static for twenty

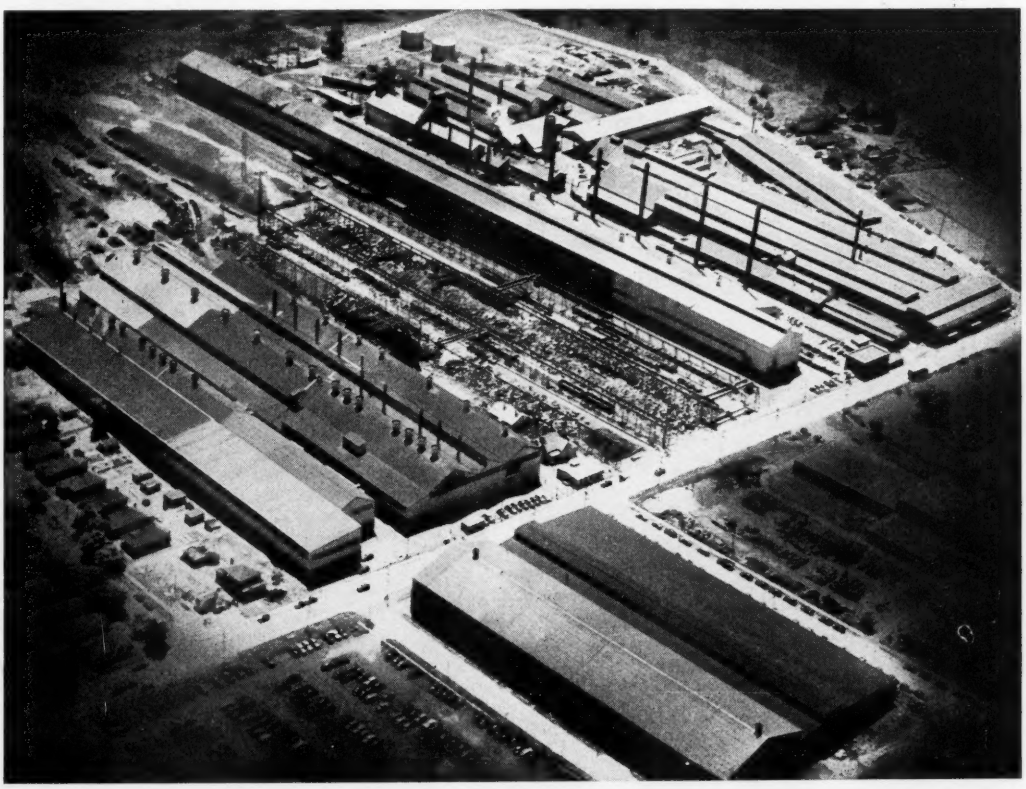


Figure 3 — Airplane Wiew of Continental Steel Corporation Plant

years, began about this time to evaluate the new offerings, carbides, continuous dry drawing, and the like, with the result that in 1935 there was a complete revamping. Both Morgan-Connor and Vaughn machinery played a part, the latter predominating, Cleveland Crane & Engineering Co. put in straight line cleaning, and a substantial start has been made in shifting from car-top pot to Lee Wilson bell type annealers. Like most mills of its type and general location, Kokomo has, in the past few years, leaned strongly toward manufacturers' wire and fine sizes, though not as yet into high carbons.

* * *

NAILS are produced, in a full line, and every type of woven fencing, including chain link. Kokomo, or Continental, as we must get accustomed to calling her, has her own peculiar type of galvanizing, called Flame Sealed, applied to about half the product. This flame treatment after coating is designed to cause a diffusion of the base metal and the zinc into each other, and broaden the contact zone. No licenses have been granted under the Flame Sealed patents; Continental reserves the use to itself. Bale ties are a regular line.

* * *

RESISTANCE of Continental products to corrosion, sheet products as well as fence wire, depends not alone on adequate coverage by zinc, but on a special steel described as **"Konik."** This mixture carries relatively small amounts of copper, nickel, chromium, and phosphorus, the latter being present not as residual phosphorus but as a calculated addition. The resulting steel has beaten, under a variety of test conditions, steels of considerably higher alloy content and price.

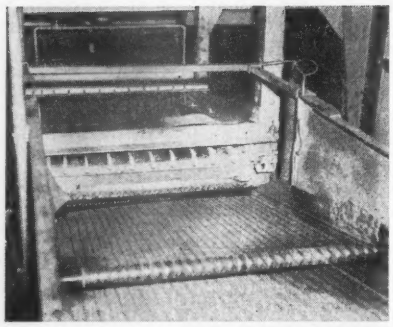


Figure 6 — Coating Flame Sealed Wire

* * *

WHEN **Continental** was formed, in 1927, **Henry Roemer** was named president, and **D. A. Williams** vice-president in charge of operations for all three plants. Mr. Williams became president in 1931, and last January, when **Ralph Clifford** took over, Mr. Williams became chairman. He came to Continental from Superior Sheet Steel Co., and has been a steel man all his life. Others of the Continental family are better known to wire men. **Julian Schueler** came to Kokomo as chief metallurgist in 1928, from the same job at Keystone in Peoria, bringing with him, among other things, that keen appreciation for quality in galvanized coatings which has always been a living force at Keystone, and which flowered promptly into **"Flame sealed"** wire. Julian has always been a member of the Wire Association, and a generous contributor to our common fund of knowledge. He is now general superintendent at Kokomo.

* * *

EQUALLY well known and liked is **C. A. Kellogg,** who heads the department of metallurgy and inspection. **Gus Pearson,** (O. G., for the record), has been wire mill superintendent for nearly thirty years, prior to which time he worked about fourteen years for Youngstown Sheet and Tube Co. at Struthers, and still further back for Page and for Washburn & Moen in Worcester. **Arthur Miller** is Schueler's assistant, and **W. O. Trownsell** is now chief metallurgist for the wire division.

* * *

DON Horsman joined the force in 1935, coming from Purdue, and has worked up through metallurgical and administrative jobs to be in charge of rolling mills, where he is assisted in the rod mill by **Charles M. Coe,** and in the blooming and billet mills by **William Clawson.**

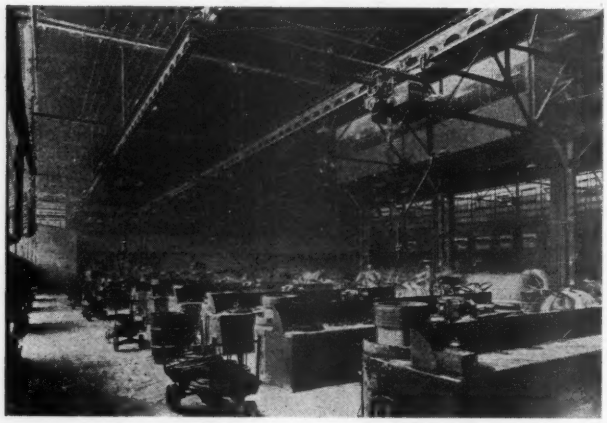


Figure 4 — View of Wire Mill

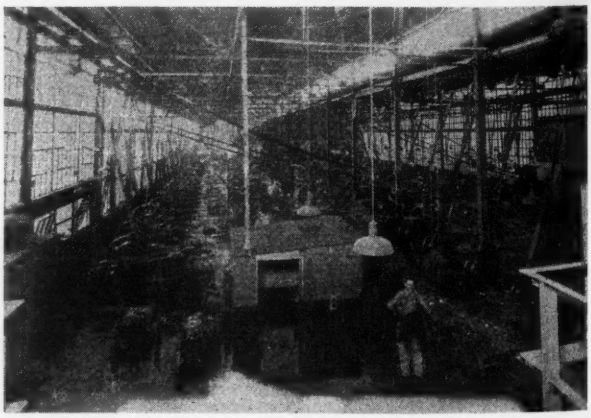


Figure 5 — View of Nail Mill

SOMEONE has aptly said that any institution is the lengthened shadow of a man. Continental is, to a wire man, a sort of lengthened composite shadow of **John Fredrick, Ralph Clifford, Gus Pearson, Julian Schueler,** and **Chet Kellogg.** Its composite character, if you can imagine such a thing, would be marked by friendliness, helpfulness, soundness, and a progressive spirit tempered adequately by prudence. Verses by Alexander Pope come to mind: (I think it was Pope, if I am wrong I shall hear from **John Callaghan)**

"Be not the first by whom the new is tried,
Nor yet the last to lay the old aside."

* * *

LOOKING over my notes I find that as a salesman of wire mill equipment that was considered a bit advanced in design, I first laid siege to John Fredrick in 1912, and made my first sale to Ralph Clifford in about 1926. That's prudence, though I distinctly recall that at the time I had another term for it. But I shall always be grateful to Ralph Clifford the chemist, who initiated me into the mysteries of controlled fermentation during a period when certain amber fluids were in short supply, and great demand.

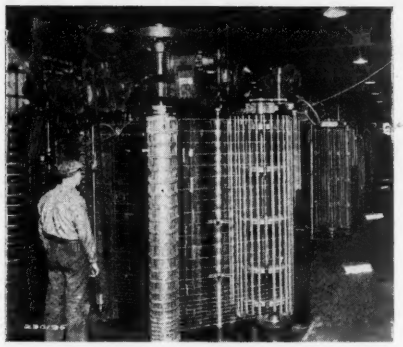


Figure 9 — Weaving Continental Fence

* * *

NOW to end in a burst of statistics, the present production of the rod mill exceeds 500 tons a day, all of which is required to keep the wire mill busy. Cleaning is "straight line," as said, wire drawing is practically all on modern double-decked and continuous machines. The nail department can turn out about 300 kegs an hour, galvanize 60 kegs, and blue about six. The first nail machines were locally made, and of a double-ended type, which was later abandoned. Many of the present machines are Glader.

FOUR galvanizing units are in operation, two single and two double, of which the latter are on Flame sealed wire. Thirty barb wire machines are in operation. Field and poultry fence are made on machines of Kokomo design, twenty seven in all, seven of which are on ornamental fence. On field fence both hinged joint and "Pioneer," a Kokomo trade name, are made. What has been said heretofore relates to the south plant, the newer of the two in Kokomo. The north plant, originally the sole mill, turns out chain-link and diamond mesh, at the rate of over three tons an hour, in addition to gates and fence hardware in general. North works has its own galvanizing equipment.

* * *

WHILE the foregoing is a complete story so far as wire is concerned, the observant reader will have noted that the capacity of the mill in steel and in breakdown facilities is about double the wire production. The other half of the steel goes into sheet products of which **Continental** is equally proud. Much of it is of **Konik** metal, and a specialty is galvannealed sheets whose mat surface takes paint remarkably well.

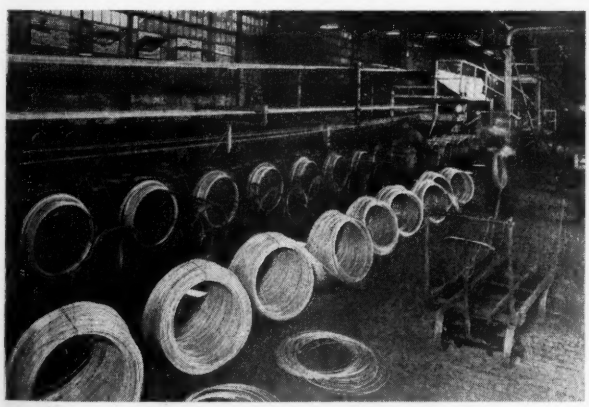


Figure 7 —Flame Sealed Wire

Figure 8 — Wire Fence Storage

All wire mill men are invited to attend the
Los Angeles Regional Meeting of the Wire Association at the
Los Angeles Biltmore Hotel, Los Angeles, California, Friday, June 6th, 1947
Topic — "NEW DEVELOPMENTS IN CARBIDES"
Dinner Meeting, 6 p. m. — Registration Fee, $4.00
Reservations made direct to K. H. Davis, Pres., K. H. Davis Wire & Cable Corp., Los Angeles, California.
THE WIRE ASSOCIATION
300 Main Street, Stamford, Conn.

LABOR RELATIONS

by John B. Stone
Washington, D. C.

The first in a series of articles on this subject, with particular reference to problems of the wire and wire products industry. The author is a noted authority on the subject.

NOW is the time for the Wire and Wire Products industry to work out its own labor-management relations on terms more or less to its own liking.

* * *

THAT is the burden of conclusions reached here by representatives of industry who express the fear that too many plant managers and heads of individual enterprises are sitting back and leaving it to Congress to do the job.

* * *

RESPONSIBLE labor leaders join in this opinion privately though they are not saying so for public consumption.

* * *

LABOR relations are thought of too often in terms of a single closely integrated industry such as primary steel, these observers point out. In these industries a single set of rules or laws can often be adopted to govern the relations between management and workers in all parts of the country and in all branches of industry.

* * *

BUT manufacturers of Wire and Wire Products know only too well that a significant portion of American industry does not fit into any such neat pattern. This industry cuts across lines dividing steel fabricators from producers in the non-ferrous field and also across lines dividing CIO from AF of L unions and even different unions within the CIO and the AF of L.

* * *

THAT is a major reason for the conclusion that now is the time to work out a satisfactory and relatively permanent working basis on an individual plant level.

* * *

OTHER factors pointing towards the necessity of positive action now by individual plant managers include:

* * *

1. FEDERAL action, either through acts of Congress or by decisions of the chief executive or quasi-executive boards such as the National Labor Relations Board, will not define labor relations in terms that will fit into the necessary picture for smooth operations at the plant level.

* * *

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Unit design of frame, transformer and power sub-assemblies permit other range of sizes to suit requirements.

Equipped with a temperature indicating annealing and tempering device, voltage regulator and meter to compensate for voltage fluctuation, wire cutters, extra large 5" diameter magnifying glass, fluorescent light and extension cord. Welder can be supplied for bench mounting, or mounted on 4-wheel truck.

The adaptability of this unit for welding all types of wire, either ferrous or non-ferrous, in sizes from .005" to .020" diameter, make it ideal for the fine wire manufacturer.

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CHICAGO 6, ILL.
Telephone: State 7468

THE most that new federal labor laws can do is to (a) ban industry wide organizing and negotiations. This would still leave it up to managers to work out their own individual problems; (b) ban jurisdictional strikes. Any plant manager knows that there are many headaches in the labor field other than actual strikes and boycotts that result from intra-union rivalry; (c) ban strikes in industries vitally affecting the national welfare. This may set a needed limitation on the power of labor unions to halt the national economy but it hardly provides the individual plant manager with a blueprint for smooth and speedy production; (d) set up a new mediation board. This will merely spread out the already existing confusion under a more decentralized administration.

* * *

BOTH the White House and the National Labor Relations Board have given unmistakable evidence in recent months of a more conciliatory attitude toward management. Possibly, as is charged by some segments of management, both of these trends are caused by the so called "anti-labor" sentiment in Congress. It may be true that the NLRB is moving to the right in order to head off Congressional action clipping its wings. Also the White House probably has an eye to conciliating the right wing of the Democratic party and some Republicans before really drastic changes are made in the national labor management pattern.

* * *

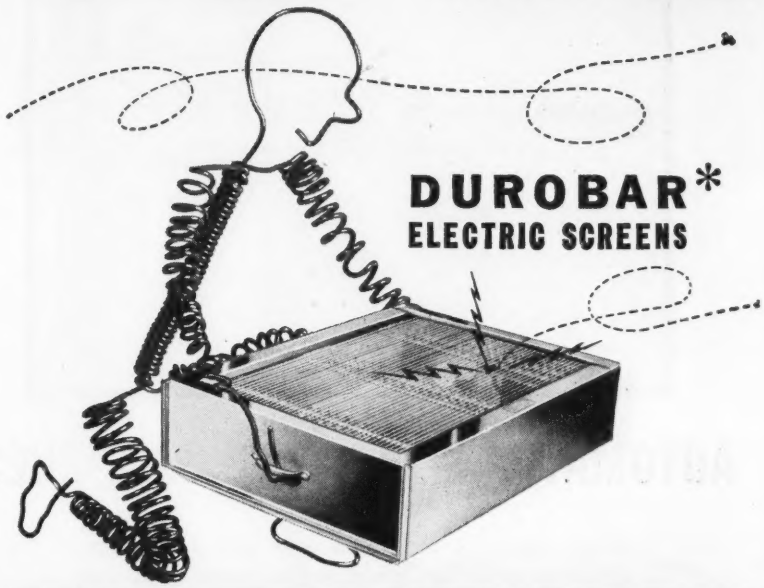
BUT these trends together with the attitude of the Eightieth Congress do spell out one positive fact — that the attitude of the Federal Government is now much cooler towards labor generally and much more conciliatory towards business.

* * *

PERHAPS the most significant point developing from this situation will not be any legislation at all or any specific executive decision, but an attitude on the part of Washington which individual business executives will find more conducive to working out a fair basis of labor relations.

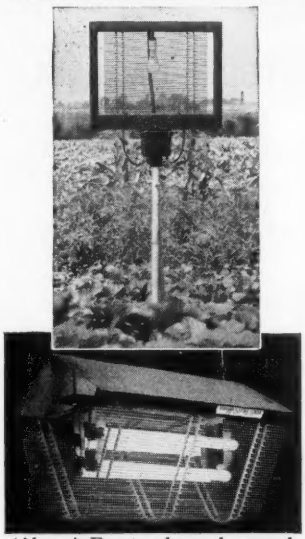
* * *

"HOT SEAT" FOR FLIES



made with
KEYSTONE WIRE

Other DUROBAR Electric Screens



(Above) For truck gardens and orchards.
(Below) Special model designed for Purdue University, used on corn borer control tests.

A deadly exterminator of flies and insects — in models for use in truck gardens and orchards, on screen doors and windows, and all inside locations. A built-in light draws the flies and insects . . . the electrified screen puts them away.

Many Durobar Electric Screens are used in barns and food processing plants where the air is charged with dilute acids and alkalies — very corrosive to ordinary steel wire. But special "Galvannealed" Keystone wire resists corrosion — valuable for Durobar Electric Screens and other applications where corrosion is a factor.

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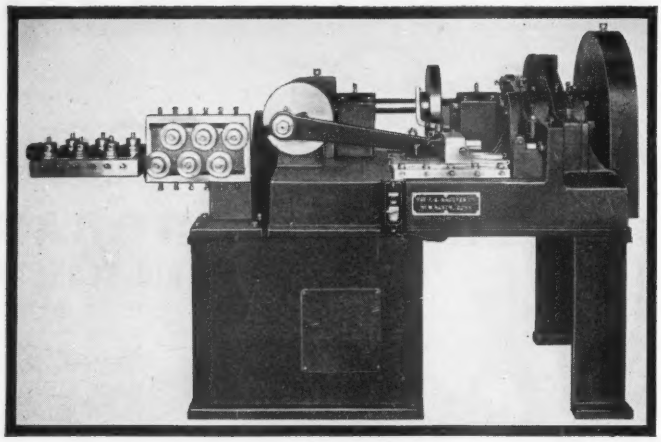

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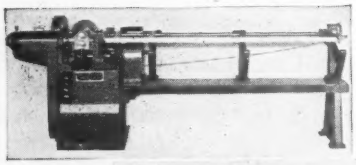
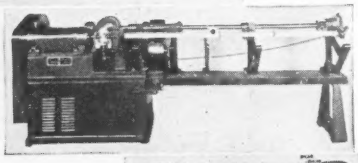
These machines straighten and cut round, hex, square and various other shaped stock from coils — and are especially recommended where accuracy and a square cut are very essential. The machine shown above has 3/8″ capacity with 7½″ maximum length of cut. Other sizes are also available. When writing for information, please give shape, size and kind of material to be straightened and the maximum length of cut required.

OTHER SHUSTER WIRE STRAIGHTENING MACHINES



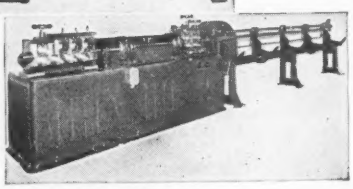
Type 1A
1/16″ - 3/16″
Dia.



Type 2A
1/8″ - 1/4″
Dia.

Type 3A
3/16″ - 3/8″ Dia.

Type 4A (not shown)
3/8″ - 5/8″ Dia.



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SHUSTER SINCE 1866

Automatic WIRE STRAIGHTENING AND CUTTING MACHINES

2. AN equally important factor in the present situation is the reluctance of organized labor to precipitate strikes. There are two reasons for this; first, many unions have exhausted reserves in the strikes of 1946, and the cost of living rise, though it fosters demands for higher wages, has also made the working man reluctant to lose what income he has by going on strike. Secondly, the union leaders know that any big strikes now will bring immediate reprisals from Congress. Labor is more willing now to get down to brass tacks than at any time since V-E day.

* * *

SOME concrete plans for taking advantage of this situation already have presented themselves. On a national scale it is significant that the rubber workers of the CIO settled for much less than they had demanded in order to avoid a strike. The Nash division of the UAW also settled for ten cents an hour.

* * *

THE industry wide job classification finished last year by "big steel" and the United Steel Workers gives a clue to positive action of that nature by individual plants.

* * *

MEANWHILE the "Toledo plan" under which local labor-management problems are settled by the "best minds" of the locality has been making giant strides. Proof of this can be seen alone in the adoption of a similar plan in New York City. Dozens of smaller towns are following suit. Here is something concrete for the head of the medium sized wire or wire products plant to bite into.

* * *

A guide sign in the same direction is the report of the Committee for Economic Development which called for building up the Conciliation Service of the Department of Labor into an effective agency with power to force either labor or management to submit to mediation before a strike is called. This could be applied on local levels as well as to national industries.

* * *

AT any rate while the picture on a nation wide panorama is still confused and uncertain there seems little doubt that negotiations now on the local level can be carried out in an atmosphere more favorable to the employer than at any other time since the New Deal was set up in Washington.

* * *

Belgium To Have Centenial Congress

THE Association of Engineers will celebrate its Centenary by holding a Congress and Exhibition at the University of Liege (A.I. Lg.) to which engineers and industrialists are cordially invited.

* * *

THE Congress, which is entitled "PAST, PRESENT AND FUTURE OF OUR INDUSTRY" will take place in Liege from Saturday, August 30th, to Saturday, September 13th, 1947.

* * *

THE fourteen divisions of this will be: MINES — GEOLOGY — METALLURGY — MECHANICS — ELECTRICITY — CHEMISTRY — CIVIL ENGINEERING — TRANSPORTS — AGRICULTURE — ECONOMICAL, PROFESSIONAL and SOCIAL PROBLEMS — COLONIAL SECTION — TEXTILE — ALIMENTATION — ART OF ENGINEER and MUSICAL ART.

* * *

MORE than 700 reporters from these divisions will picture the actual state of the industrial activity in Belgium and try to clearly set forth the future prospects and plans for advancement.

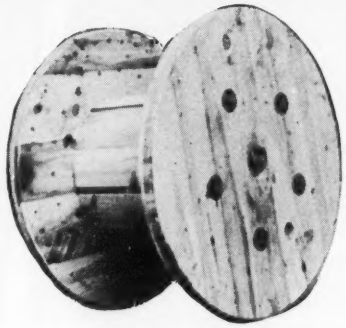
* * *

DURING August and September an Exhibition entitled "International Exhibition of Scientific Research and Industrial Control" will take place in the three Institutes of the Faculty of Applied Sciences.

* * *

ITS aim is to put forward methods and instruments of pure research as well as of industrial control, which circumstances have perhaps prevented from having sufficient

REELS



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There are many installations of Morrison Flash Bakers performing faithfully—year in and year out. In fact, Morrison specialists have designed, built, and installed more Flash Bakers than any other single firm.

Of course, the Morrison Flash Baker of today has undergone many improvements in design and construction since the early installations but the basic fundamentals of good, sound engineering principles still predominate.

You can expect, and you *will get* the *BEST* when Morrison specialized experts plan a job for you. A modern Flash Baker by MORRISON can answer many problems for you such as: . . . increase your rod or wire baking capacity . . . speed-up production . . . reduce fuel costs and operating costs . . . improve drawing characteristics, and achieve a fine lime coating absolutely free of rust.

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development in our country because of the extraordinary war effort.

* * *

NUMEROUS laboratories will be shown at work; they will be at the visitors' disposal for eventual experiments.

* * *

BELGIAN and foreign firms will prove the value of recognized formulas by practical examples and obtained results.

* * *

A large participation on the part of Belgian and foreign constructors has been already secured.

* * *

New Publication for Exporters

BOOMING interest in international trade and transportation has resulted in The Bureau of National Affairs issuing a publication called the **International Trade Reporter.**

* * *

COMPLETE in two loose-leaf volumes, the Reporter is an organized guide of information on shipping, packing, manufacturing, marketing, and financing suppliers. More than a year in the making, it is filled with official data from more than a score of trade offices and agencies, domestic and foreign.

* * *

TO keep the user up-to-the-minute with the latest postwar developments in the field BNA's International Trade Reporter will be supplemented and revised weekly from Washington. It will also include a weekly Survey and Analysis of current export happening and trends plus periodic studies on trade laws, credit facilities, and market conditions and characteristics in overseas outlets.

SEND IN YOUR ORDER NOW for the 1947 WIRE BUYERS GUIDE

GOVERNMENT WIRE PRODUCTION INFORMATION

Metallurgical Research Methods Report Now On Sale

ABOUT one hundred metallurgical research projects undertaken by scores of industrial, university and government laboratories to meet the wartime need for better metals, stronger welds and faster fabrication methods are described in a report now on sale by the Office of Technical Services, Department of Commerce.

* * *

THE 93-page report summarizing the outstanding results of the wartime metallurgical research program was written by John Herrick for the Joint Board on Scientific Information Policy of the armed forces and top war agencies.

* * *

"AMERICAN metallurgical technology has been advanced many years by wartime research, and industry can profit greatly by applying the new facts and methods learned under the pressure of war,' John C. Green, director of OTS, said in announcing release of the report. "The entire metalworking industry contributed to this research and can utilize the peacetime benefits which are now available," he added.

* * *

"IMPORTANT results achieved by metallurgical research projects are described in Mr. Herrick's summary. The report also serves as a guide to hundreds of individual project reports which describe those studios in greater detail. Project reports are being released to industry by OTS as fast as they can be processed after removal of wartime security restrictions. Industrial establishments are already utilizing many of the metallurgical reports available through OTS."

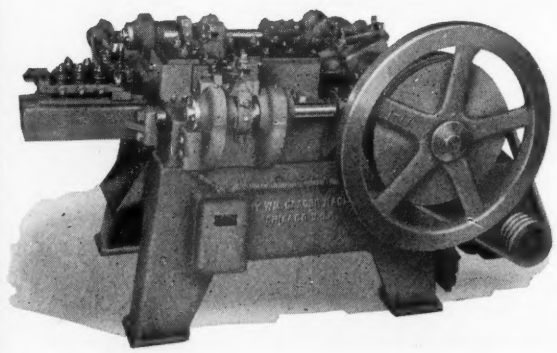
* * *

PROBABLY the greatest contribution of industry to the American war research effort was in the field of metallurgy, according to Mr. Herrick's report. Executies and industrial research workers frequently gave their time and ability without compensation and numerous research projects were financed out of industry's own funds. Competing industries tossed hitherto secret information into the common pool for all to draw on, the report states.

* * *

APPROXIMATELY three-fifths of the research contracts were placed with industrial research laboratories, the remaining projects going to university laboratories or endowed research institutions, according to Mr. Herrick.

GLADER HIGH SPEED WIRE NAIL MACHINE



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High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

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MAJOR fields of investigation summarized in this report include welding, aircraft materials, metals for high temperature service, foundry materials and processes, armor, guns and gun steels, ammunition, examination of enemy material, properties of miscellaneous materials, and conservation, substitution and processing.

* * *

RESEARCH was initiated early in the war to solve serious problems in the welding of steel hulls and to eliminate the occasional failures which marked the first welded ships. Those studios disclosed new facts concerning the magnitude and general pattern of residual and locked-in stresses and led to important changes in the fabrication and structural design of welded vessels, according to the report. Typical titles of projects dealing with welding and shipbuilding, mentioned in the report, are: Residual stresses in ship welding; cleavage fracture of ship plate as influenced by design and metallurgical factors; weldability of steel for hull construction, and fatigue tests of ship welds.

* * *

THE production, properties and metallurgy of magnesium were the subject of another comprehensive wartime research program. Numerous studies were undertaken to facilitate this light metal's use in aircraft and other industrial applications. The deformation characteristics of magnesium alloys, foundry techniques and practices, fatigue properties, heat treatment, formability of magnesium alloy sheet, and stress corrosion properties, are projects also summarized in the report.

* * *

ORDERS for the report (PB-52353: **Metallurgical Research in World War II:** mimeographed, 50 cents; dated September 1946) should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

W.A.A. Disposes of Surplus Fasteners

ALL surplus ferrous and nonferrous bolts, nuts, screws, rivets and related items except aircraft types held by War Assets Administration were scheduled for disposal by April 30, 1947. These cost the Government $10,000,000.

* * *

OFFERED in sales programs were various types of carriage bolts, lag bolts, machine bolts, stud bolts, toggle bolts, hexagon nuts, machine screw nuts, square nuts, stove bolt nuts, wing nuts, thumb nuts, cap screws, machine screws, set screws. sheet metal screws, drive screws, thumb screws, wood screws, lock washers, flat washers, spring washers, and all types of rivets and cotter pins except those items peculiar to aircraft.

* * *

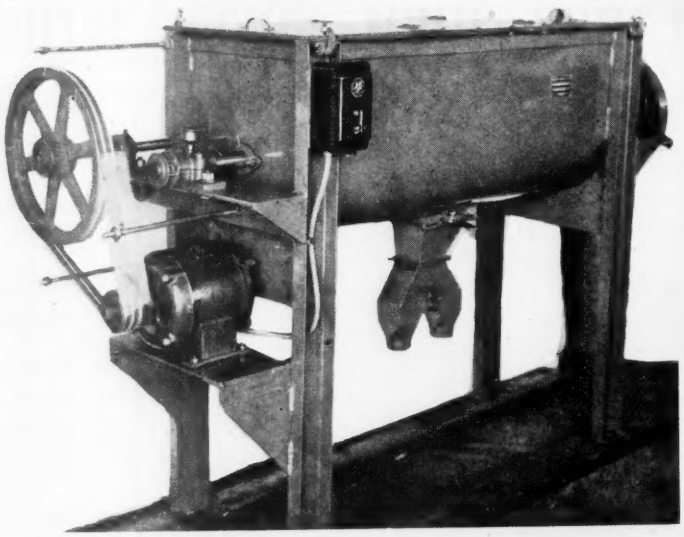
ALL regions were directed to offer at uniform established fixed prices standard bolts, nuts, screws, rivets and similar products.

CHEMICAL **MIXERS**

Horizontal Batch and Continuous Types made in 1 cu. ft. to 235 cu. ft. capacities, Either Jacketed or Plain.

Custom Mixers Engineered To Suit Requirement of User.

Also make Grinders, Crushers, Elevating and Conveying Equipment, Commercial Type Pressure Cookers, Stranders, Closers, Wire Winders and a General Line of WIRE MACHINERY.



The machine illustrated above is a horizontal mixer.

Put your mill equipment problems up to the

HUGHESVILLE MACHINE and TOOL COMPANY

HUGHESVILLE, PENNA.
Phone: 129-A

WIRE AND PROCESS MACHINERY

THOMAS S. HUGHES
33 Admiral Road
Toronto 5, Ont., Can.

Outstanding Personalities of the Wire Industry

Nisbet Made Superintendent of G.E.'s New Waterford Works

APPOINTMENT of **Robert A. Nisbet** as superintendent of the Waterford Works of the **General Electric Chemical Department** was announced today by **Harry K. Collins,** manager of the General Electric Resins and Insulation Materials Division. The Waterford, N. Y. Works, which is now under construction, will be used for the manufacture of silicone products.

* * *

MR. Nisbet, who has been assistant general forman in the silicone pilot plant for the past two years, is a graduate of Massachusetts Institute of Technology. He joined the General Electric Company immediately upon graduation as a student engineer and later served as engineer of factory equipment. He came to the Resin and Insulation Material Division in 1945 as assistant general foreman in the silicone pilot plant shortly after the formation of the Chemical Department.

* * *

Made Director of Purchases for Wickwire-Spencer

W. T. Stratton has been appointed Director of Purchases of the **Wickwire Spencer Steel Division of the Colorado Fuel and Iron Corporation** with headquarters at the Curtiss Building, 361 Delaware Avenue, Buffalo 2, New York. Mr. Stratton will replace Mr. E. A. Johnston, who has resigned.

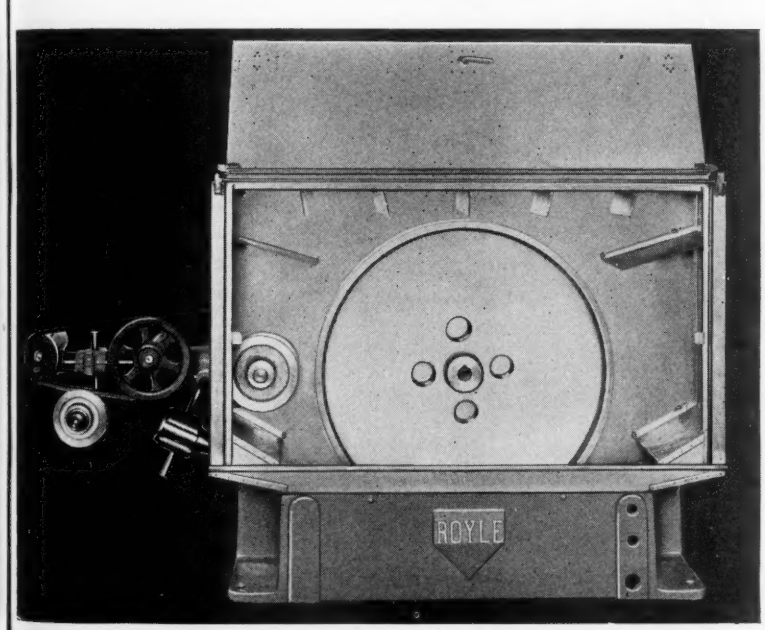
* * *

MR. Stratton brings to his new association a total of 28 years in the purchasing and traffic departments of the steel industry. He started with the United Alloy Steel Corporation in Canton, Ohio in 1916. In 1929 the United Alloy Steel Corporation merged with the Republic Steel Corporation and he continued in the employ of the Republic Steel Corporation till 1944 when he joined the Valley Camp Coal Company as District Manager at Cincinnati, Ohio.

* * *

Firth Sterling Appoints Sales Manager for Pittsburgh District

C. R. Harmon has been appointed Pittsburgh District Sales Manager for **Firth Sterling Steel & Carbide Corporation,** McKeesport, Pa. Mr. Harmon until recently was sales manager for Penn Carbide & Alloy Casting Company and formerly was with Jessop Steel Co., and Crucible Steel Co. of America.



The Royle 36″ High Speed Capstan for Resin Insulated Wire

- Stainless steel watertight enclosure
- Total enclosure permits higher wire speeds
- More efficient wire puller stabilizes wire speed
- Secondary idler pulleys guide wire across capstan preventing rubbing and permitting larger quantities to be cooled simultaneously
- All bearing located outside of enclosure to prevent contact with water
- Quiet running
- Built-in air wiper

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England — James Day (Machinery) Ltd. — REgent 2430
Home Office — E. B. Trout J. W. VanRiper — SHerwood 2-8262
Akron, Ohio — J. C. Clinefelter — JEfferson 3264
Los Angeles, Col. — H. M. Royal, Inc. — LOgan 3261

PATERSON 3, NEW JERSEY

A. S. & W. Appointments

WADE B. Houk has been appointed division superintendent of the wire mill, South Works, Worcester, Mass., plant of the **American Steel & Wire Co.**, Cleveland. **Harvey R. Rice** has been promoted to a special assignment on the staff of the Worcester district manager. **Robert N. C. Hessel** has been named department superintendent of the cold roll, and **A. K. Zeitell** has been named department superintendent of the round wire department of that district.

* * *

Holcomb New P&H Sales Manager

HARNISCHFEGER Corporation of Milwaukee, builder of P&H products, has announced the appointment of **Ralph D. Holcomb** as General Sales Manager. He will direct the sales of all P&H products, excavators, road machinery, hoists, cranes and welding equipment.

MR. Holcomb's elevation to his new post follows 18 years of continuous service with the P&H organization.

* * *

Canadian Steel Corporation Announces Changes

AS a result of the retirement of **W. J. Twible**, formerly General Manager of Graham Nail and Wire, Toronto, who is now able to take a well-earned rest after a long period of service to the industry, a number of other shifts in responsibility have become necessary. These have been effected.

* * *

JOHN C. Coppick, formerly Superintendent, Canadian Steel Corporation, is now Works Manager in charge of operations at Graham Nail & Wire, Toronto, and Canadian Steel Corp., Ojibway.

* * *

JULIUS O. Carlson, formerly General Foreman, Canadian Steel Corporation, was appointed Superintendent, Canadian Steel Corporation, Ojibway, in full charge of operations at the Ojibway plant.

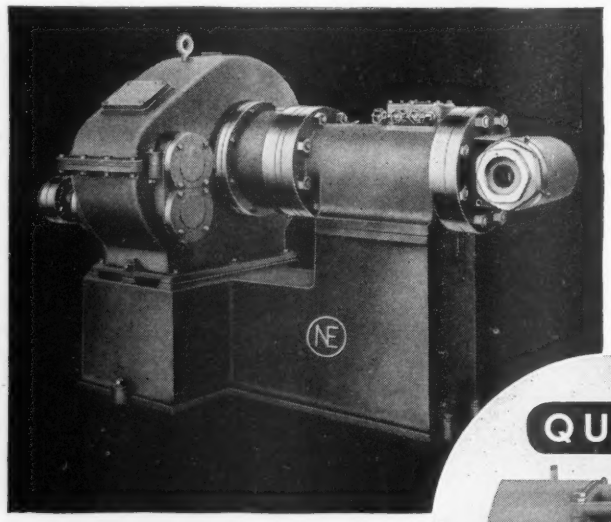
* * *

LLOYD McKenzie, formerly Foreman of Wire Mill, Graham, now is Superintendest in charge of operations Graham Nail & Wire, Toronto.

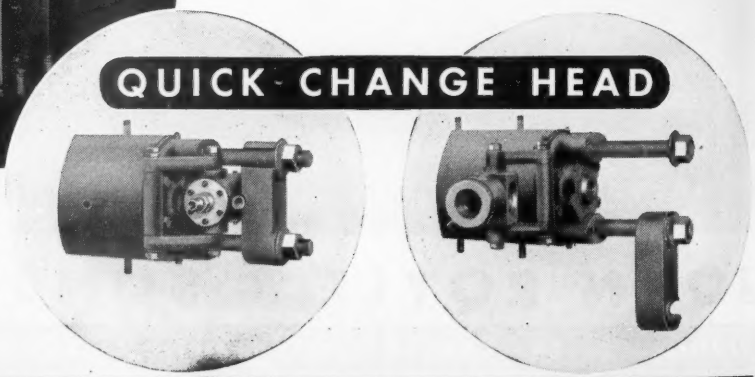
* * *

R. A. Neal Appointed General Manager Westinghouse Pacific Coast Operations

ROBERT A. Neal, vice-president of Wesctinghouse Electric Corp., has been named general manager of the company's expanding Pacific Coast operations. Mr. Neal will make his headquarters in San Francisco and at the company's newly acquired plant at Sunnyvale, Calif., formerly operated by the Joshua Hendy Iron Works. He was formerly vice-president in charge of apparatus sales, with offices in Pittsburgh.



NE TUBERS *adaptable to* **variety of products. Illustrated at left is a 4½" NE tuber equipped with cross-feed flanged-type head for insulating wire, extruding hose covering, special shapes or tubing. With slight modifications, either rubber or plastics can be handled.**



NE Quick Change Head Unit permits swinging Die Head out, for cleaning, inspection or changing. Just loosen 2 bolts. This feature illustrated on a 3½" NE Tuber is available on all sizes thru 6".

NATIONAL-ERIE CORPORATION
ERIE, PA. U. S. A.

T. C. Batchelor
Latch and Batchelor, Ltd.
Birmingham, England

WE regret to record the passing of **Mr. T. C. Batchelor** on March 3rd., at his Leamington Spa residence.

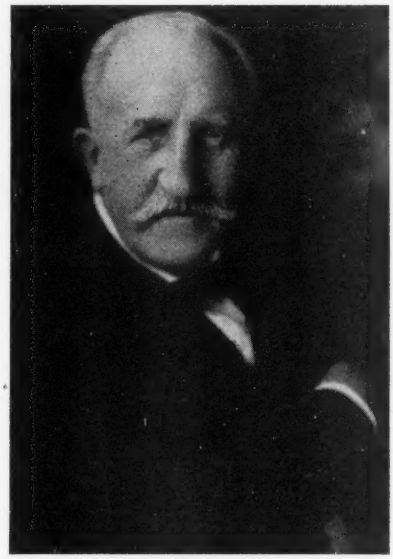
* * *

TO within a few months of his death he was actively interested in the conduct of Latch & Batchelor, Ltd., of Hay Mills, Birmingham, of which Company he was joint Managing Director from its inception.

* * *

TELFORD Clarence Batchelor was born at Christchurch, Caerleon, Monmouthshire, on August 2nd 1857, the son of Henry Batchelor a naval architect. In his youth he was actively engaged in his father's consulting practice. Many of the elaborate, colored drawings illustrating ships' machinery and fashionable at that time, were produced by him for the South Kensington Museum.

IT was, however, his invention of the **Locked Coil Rope,** so revolutionary in character, which made his name known all over the world, followed by the Flattened Strand type, which has become equally well known in mining and engineering. Both Master patents were eventually operated under licence in all the leading industrial countries, some of which he personally visited to initiate manufacture.



T. C. Batchelor
Latch & Batchelor, Ltd.

* * *

IN the U. S. A. the licence for the manufacture of Locked Coil ropes was granted to the Trenton Iron Co., Ltd., of New Jersey, and the Flattened Strand to A. Leschen & Sons Rope Company of St. Louis.

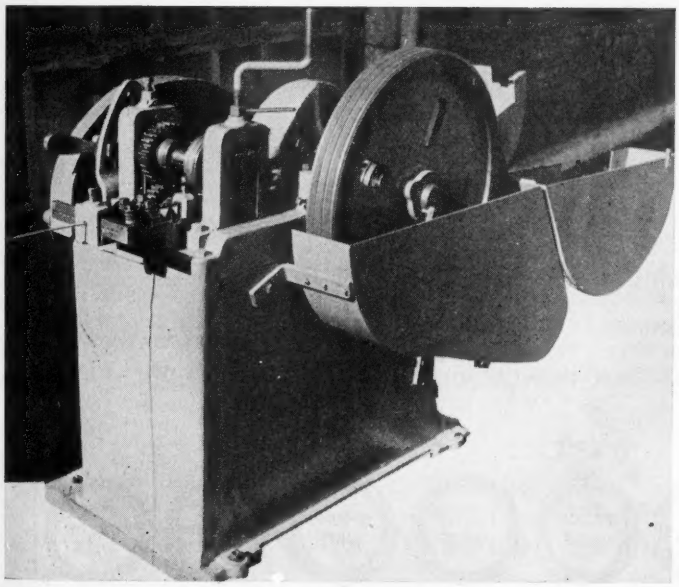
* * *

NUMEROUS other rope patents stand to his credit, and many rope manufacturing processes, few of which however, were made public knowledge by patent.

* * *

J. J. Wilson of Roebling's Dies

IT is with deepest regret that **John A. Roebling's Sons Company** announces the death of **J. J.**



HERE IT IS!

THE HUMPHREY RAPID FENCE STAPLE MACHINE

CUTS FENCE STAPLES 5/8" to 1 5/8", 900 TO 1000 PER MINUTE, UNIFORM IN SIZE, EVEN LEGS, CLEAN SHARP POINTS.

Also makes, with Attachments, Poultry Netting Staples and Double Pointed Tacks.

MANUFACTURED EXCLUSIVELY
for

REED and RICHARDS TRANSATLANTIC, INC.

CHANIN BLDG., 122 EAST 42nd ST., NEW YORK 17, N. Y., U.S.A.
REG. CABLE ADD.: "LOUREED, NEW YORK".

Wire Bale Tie Machines — *For export only: Double-Gear Windmills & Pump Jacks*

Wilson, Seattle Branch Manager, on March 6, 1947.

* * *

MR. Wilson was born in Lawrence, Kansas, 59 years ago and moved to Seattle in 1905. He was widely known in the mining and logging industries as a wire rope engineer. It was in this capacity that he began his association with Roebling in February, 1920.

* * *

Head of Electric Furnace Co. Passes

ROLAND F. Benzinger, President of **The Electric Furnace Company,** Salem, Ohio, died at his home, 1241 East State Street, Salem, on Tuesday morning March 25th, after 22 months illness from a heart ailment.

* * *

MR. Benzinger, who was born in New York, was 55 years of age and was widely known throughout the metal working industry.

HE was one of the founders of The Electric Furnace Company, having served as its Vice President and Secretary from 1923 to 1937 and as its President since 1937.

* * *

HE was a member of the American Society for Metals and served as President of the Industrial Furnace Manufacturers Association for several years.

* * *

HE leaves a wife and two daughters.

* * *

H. B. Carnahan Works Manager, Canada Wire & Cable Co.

H. B. Carnahan has been appointed Works Manager of the Canada Wire and Cable Company succeeding **W. D. Horsfall** who has resigned. Mr. Carnahan who has the responsibility of both their Leaside and Montreal plants, is a Director and Vice President of the Wire Association.

Carl Mayer Listed in Who's Who

THE Tenth Anniversary international issue of "Who's Who in Commerce and Industry", published by "Who's Who in America", includes interesting mention of **Carl F. Mayer,** President of The Carl Mayer Corporation, builders of industrial ovens, core and mold ovens, rod bakers and furnaces.

* * *

THIS listing of Mr. Mayer results from his active work in Smaller Business of America, of which organization he was president in 1944, the Industrial Furnace Manufacturers Association, of which he has been a director and because of his service on the Industrial Advisory Board of the War Production Board.

* * *

MR. Mayer has written many articles for the industrial press and holds a number of important patents on types of ovens and furnaces manufactured by his Company.

A Review of Recent Wire Patents

No. 2,416,832, NAIL STRAIGHTENING MACHINE, patented March 4, 1947 by George Delbert Hulburt, Los Angeles, Calif., assignor to Twentieth Century-Fox Film Corporation, Los Angeles, Calif., a corporation of New York.

Bent nails are received in dies, with their pointed ends projecting out of the dies, and a reciprocating shoe, exerts pressure to straighten the nails, whereupon a member strikes the projecting ends of the nails to drive them out of the dies.

★ ★ ★

No. 2,416,864, METHOD OF COATING WIRE-WOUND ELECTRICAL RESISTORS, patented March 4, 1947 by Burton E. Bricker, Rahway, N. J., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware.

To the wire-wound core is applied a coating of a slip comprising an aqueous suspension of a clay taken from the group consisting of kaolin clay and ball clay, and bentonite in a proportion of 98% to 50% clay and 2% to 50% bentonite, the slip being sufficiently fluid to flow between the wire windings and to drain from the spaces between windings to leave a uniform coating on the surfaces contacted; the coating is then dried and a coating of a vitreous enamel slip is applied over the dry clay-bentonite coating.

★ ★ ★

No. 2,416,955, HEAT-RESISTANT ELECTRIC INSULATION COMPRISING RUBBER AND CHLORINATED DIPHENLYS, patented March 4, 1947, by Samuel J. Rosch, Yonkers, N. Y., assignor to Anaconda Wire and Cable Company, a corporation of Delaware.

About the wire conductor is an insulation capable of continuous operation at temperatures up to 90° C. and of emergency operation for short intervals at temperatures up to 125° C. and comprising a rubber composition containing in intimate association therewith from 10 to 25% by weight of a halogenated diphenyl having a softening point upwards of 250° C. and from 2 to 15% by weight of a plasticizing halogenated diphenyl having a softening point in the range 50° C. to 100° C.

★ ★ ★

No. 2,416,979, ELECTRIC CABLE, patented March 4, 1947 by Joseph Cilley Burley, Milton, Mass.

The wire conductor is surrounded with a tubular braided flexible conductor and insulating spacing devices separating the two conductors and comprising one or more layers of open-braided sleeve material consisting or vinyl resin plastic, so that there is provided a dielectric between the conductors consisting largely of air.

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

No. 2,417,196, MACHINE FOR TESTING HELICAL COMPRESSION SPRINGS, patented March 11, 1947 by Emmett C. Hartley and Herbert L. Ivins, Cleveland, Ohio, assignors to The Parker Appliance Company, Cleveland, Ohio, a corporation of Ohio.

Springs of various lengths may be tested.

★ ★ ★

No. 2,417,269, CONDUIT-SUPPORTED WIRE CLIP, patented March 11, 1947 by Archibald Robertson, North Hollywood, Calif., assignor to Adel Precision Products Corp., a corporation of California.

This clip comprises a single length of wire, formed into an upwardly-opening wire-supporting loop and a loop thereabove to extend around the conduit and hooked into a conduit-embracing position.

★ ★ ★

No. 2,417,608, ELECTRICAL CONDUCTOR, patented March 18, 1947 by David T. Mowry, Dayton, Ohio, assignor to Monsanto Chemical Company, St. Louis, Mo., a corporation of Delaware.

The wire conductor is embedded in a resinous polymeric material comprising an interpolymer of styrene and fumarodinitrile, said interpolymer consisting of between 0.5% and 30% of copolymerized fumarodinitrile, the balance of the interpolymer being copolymerize styrene.

★ ★ ★

No. 2,417,885, PROCESS FOR COATING COPPER WITH VINYL RESINS, patented

(*Please turn to page* 385)

UNION DIE ROOM MACHINERY

FOR

DIAMOND DIES

Union Ten-Spindle Vertical Polishing and Finishing Machine
Union Ten-Spindle Ripper
Union Precision Pin Grinder
Ten-Spindle Sway Machine (Pohenkra)
Twenty-Spindle Pohenkra
Union Hand—Shaping Lathe
Union Twelve-Head Wire Polisher

UNWIDIE

FOR

TUNGSTEN CARBIDE DIES

Union Ten-Spindle Light Duty Driller and Ripper
Union Precision Pin Grinder
Union Eight-Head Heavy Duty Driller and Ripper
Union One-Head Ripper (for round dies up to 1")
Union Single Head Automatic Polishing Lathe
Union Polishing Head
Union Twelve-Head Wire Polisher
Union Eight-Head Shaped Die Driller and Finisher

WIRE MEN THE WORLD OVER KNOW THAT UNION DIE RECUTTING MACHINES GUARANTEE MAXIMUM DIE ROOM PRODUCTION AND EFFICIENCY

For Catalogue and Information, write our New York office.

DIAMOND POWDER **DIAMOND DIES**

THE UNION WIRE DIE CORP.

24 Gore Street, Hamilton, Ontario
71 West 45th Street, New York City 19
375 Fairfield Ave., Stamford, Conn.

Taking the Measure of Metallic Grains

A contribution to the search for better metals and by-products of his metallurgical studies in the new grain size comparator developed by F. C. Hull of the Westinghouse Research Laboratories. Consisting of a ground-glass screen hinged to an illuminating unit with a slotted wooden frame, it is easily attached to a standard metallograph. It provides for counting the grains in a certain area or estimating their extent by comparison with a series of standard photographs.

* * *

TO determine the grain size of a particular specimen, a polished and etched sample is placed on the stage of the metallograph and projected in magnified form on the glass screen. Its granular boundaries can be seen in clear, map-like form. A transparent slide of a known, standard grain structure is slipped into the wooden frame and illuminated by incandescent light. The magnifying power of the metallograph is then changed by extending the bellows until the unknown image matches the grain size of the standard. The amount of adjustment needed is read from a scale on the metallograph, and grain size of the unknown specimen determined by reference to a standard graph.

* * *

THE grain structure of metals is a most revealing clue to their qualities. Relatively large grain size may produce superior rupture and creep strength, whereas in the same metal fine grain structure may give greater tensile strength, ductility, or endurance. Knowledge of controllable grain size is vital "evidence" in metallurgical problems.

Westinghouse Produces Smallest Strand of Tungsten Wire in its History

A strand of tungsten wire so microscopic that 1,000 feet of it reeled on a bobbin appears invisible to the unaided eye has been manufactured.

* * *

THE wire, .00018" in diameter, is the smallest produced in the 40-year history of wire drawing in the tungsten department at the Westinghouse Lamp Division, Bloomfield, New Jersey. Frank A. Newcombe, manager of Westinghouse parts manufacturing, calculated that a 20-layer stack of the wire would equal only the thickness of a sheet of newsprint and that a pound of it would stretch single strand for 950 miles. The wire was processed on special assignment for the Bell Telephone Laboratories. It is required for an amplifying tube.

* * *

TO produce the .00018 inch wire, it was given a special chemical bath after being drawn through the finest diamond die available. Since such a fine wire is impossible to measure mechanically, engineers computed the average diameter by weighing an eight-inch-long strand of the wire on a scale balance sensitive enough to record the weight of a pencil mark on a postage stamp.

● Integrating reels, capstan, power source with hydraulic or electronic controls into one unit, IOI's variable-speed, constant-tension windup machine is unexcelled for smooth, stepless winding of continuous and semi-continuous materials after processing operations. It has everything.

Speed which winds wire and other materials 3 to 5 times faster than previous equipment. Control in handling materials requiring tight wrap or loose wrap with equal facility. Change of pace which continuously regulates the speed of windup reels by automatic synchronization to maintain tension regardless of diameter change.

The basic design, originally developed by IOI for more uniform finishing of cable insulation, is flexible enough to suit a wide variety of applications, with simple variations.

Complete details of IOI installations adaptable to your industry are available in booklet form. Copies will be sent upon request.

INDUSTRIAL IOI ENGINEERING VERSATILITY **OVENS, INC.**

13825 TRISKETT ROAD CLEVELAND 11, OHIO

ASSOCIATED COMPANY: JAMES DAY MACHINERY LTD., LONDON W.1, ENGLAND

Report on A.S.T.M. Meeting in February

AT a week-long series of meetings of the American Society for Testing Materials in Philadelphia recently a wide variety of subjects were covered. Among those of direct interest to the wire industry may be mentioned the following activities:

Machine Bolts and Nuts

A newly organized subcommittee under the chairmanship of **Arthur D. Morris,** Bayonne Bolt Corp., considered in detail a proposed standard specification for so-called "common" bolting, that is, machine bolts and nuts, and tap bolts, etc., for general applications. It has been evident for some time that an A.S.T.M. standard in this field would be of service, and agreement was reached on the properties to be covered, the type and number of tests to be made, and related details. The committee emphasized that the proposed standard would make reference to dimensional standards where available. The specification itself is confined primarily to the quality and testing of the bolts.

Wires for Electrical Conductors

AN important reorganization meeting was held in New York City. This is one of the oldest committees in A.S.T.M. and its title and scope originally covered only specifications for soft copper wire. For many years the committee has been responsible for all specifications for copper-alloy wires for electrical conductors. The committee has operated through task groups and has had no permanent subcommittee structure.

* * *

THE reorganization implements the recently enlarged scope of the committee to include wires of all metals that are used for electrical conductors and to establish a permanent sub-committee structure to handle the enlarged responsibilities more effectively. In addition to the advisory committee, seven subcommittees were established as follows:

I — Records and Editorial, E. H. Kendall, Chamn.
II — Methods of Test and Sampling Procedure, C. S. Gorden, Chmn.
III — Rods for Processing Into Conductors, Alfred Bellis, Chmn.
IV — Copper and Copper-Alloy Conductors, H. H. Stout, Jr., Chmn.
V — Conductor of Ferrous Metals, L. H. Winkler, Chmn.
VI — Composite Conductors of Copper and Steel, C. E. Ambelang, Chmn.
VII — Conductors of Light Metals, P. V. Faragher, Chmn.

* * *

THE new Subcommittee IV will take over most of the previous assignments of the committee while the new subcommittee VII will proceed immediately to develop specifications for aluminum conductors and for aluminum cable steel reinforced. (ACSR).

* * *

IN addition to the work of reorganization, the committee approved various minor changes in a number of existing specifications. Most of these had to do with the clarification of the requirement for tensile strength of welded joints and the gaging of wire in coils and on reels.

BUT...

It was actually only a crude beginning in the industry which has evolved the modern stratoliner. Aviation design has constantly progressed to meet the ever-present demand for rapid and efficient transportation. In the metal working industries

CHEMICALS ACP PROCESSES

RUST PROOFING AND PAINT BONDING
Granodine
Duridine
Alodine
Lithoform
Thermoil-Granodine

RUST REMOVING AND PREVENTING
Deoxidine
Peroline

PICKLING ACID INHIBITORS
Rodine

Rodine* has constantly met the demand for selective control in both sulfuric and muriatic acid pickling. RODINE minimizes acid attack on good metal but permits complete scale removal. This reduces waste of acid and metal and lengthens the life of the pickle bath.

The dangers of over-pickling, with the attendant embrittlement, are greatly lessened.

RODINE minimizes fumes, improves working conditions for the pickler and gives him effective control of the entire pickling operation.

RODINE in the pickle bath means economical scale removal, savings in acid and metal and smoother pickled surfaces.

* Trade Mark Reg. U. S. Pat. Off.

AMERICAN CHEMICAL PAINT CO.
AMBLER PENNA.

Produces Film on Material Handling

THE **Automatic Transportation Company** of Chicago, a Division of Yale and Towne, has completed a new sound motion picture showing comparisons between the older hand methods and the newer power means of handling supplies and products being moved into, around and out of industrial plants, stressing the relationship between individual handling and mechanical power to safety and costs.

* * *

WHILE Automatic electric trucks are used to illustrate what can be done through the use of this type of equipment to cut costs, the film is primarily designed to promote the idea of mechanized material handling to reduce operating expenditures by conserving man power, eliminating excessive employee fatigue, utilizing floor space to better advantage through palletized storage and multiplying the material handling ability of each man engaged in this work.

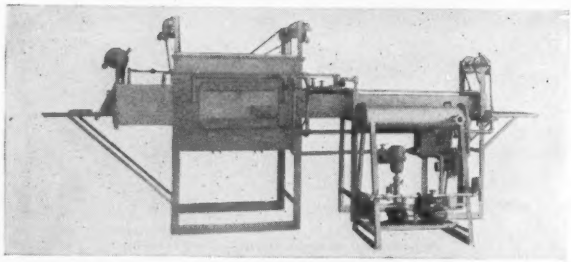
* * *

1926 — pioneered the first practical controlled-atmosphere furnace

"Certain Curtain" ELECTRIC FURNACES

TODAY — providing the most advanced types of controlled-atmosphere furnaces

"CERTAIN CURTAIN" ELECTRIC FURNACES



TYPE LA

For CLEAN annealing, copper brazing, silver soldering in Controlled Atmosphere

The famed "Certain Curtain" control conquered the most difficult atmospheric problems in high speed steel treating. These same patented methods are available in equipment expressly designed for clean annealing, copper brazing and silver soldering at temperatures up to 2000°F. Conveyor and batch types. Additional external atmosphere generator available. "Certain Curtain" equipment dissociated ammonia or hydrogen assuring the utmost in economical protection for every operation.

AVAILABLE ALSO IN CONVEYOR TYPES AND IN VARIOUS CAPACITIES

Write for "CATALOG 108"

C. I. HAYES, INC. 129 Baker St., Providence, R. I.

A number of interesting wire mill illustrations are used to demonstrate the points made. The picture, entitled "Pay Loads Pay Off", is available for showing before groups as an educational contribution to a better understanding of the subject.

* * *

THE picture was shown to representatives of the technical press at the Commodore Hotel in New York on March 12th, and is the result of two years of research to gather the ideas and material presented.

Rubber and Rubber-Like Materials

IT was announced at the meeting of A.S.T.M. Committee D-11 on Rubber and Rubber-Like Materials that the committee plans to sponsor a Symposium on Rubber to be held at the annual meeting of the society in June, 1947. It is expected the symposium will present a wealth of information obtained during the war through the Rubber Reserve and other companies in the development, manufacture, and the use of synthetic (American) rubber. The data will be timely since they could not be made available previously due to wartime restrictions.

* * *

THE Subcommittee on Insulated Wire and Cable discussed at its meeting specifications for thermoplastic jackets; also requirements for insulated conductors of small diameters and requirements for moisture-resistant insulating compounds. These matters will receive further study.

New Wire Concern Launched in England

WORD has been received that **Drawn Wires, Ltd.** has been established in London, England, with facilities to roll rods and draw wire. They will sell wire to both wire product fabricators and to the retail trade for resale to the public. The new firm's plant is located at 11 Lower Grosvenor Place, London, S.W.I. They are said to have started with an authorized capital of 50,000 pounds.

Electroplating and Cathodic Pickling as Causes of Hydrogen Embrittlement

(*Continued from page* 356)

FOR the experiments, Type 440-C stainless steel (17% chromium –1% carbon) was again used, but from another heat, and in both the annealed and cold-drawn conditions:

The electrolyte had the following composition:

CrO_3 = 500 gms.
H_2SO_4 = 3 cc.
H_2O = 775 cc. (to make 1 liter of solution)

* * *

PREVIOUS to plating, each specimen was activated by reversing the polarity and anodizing for two minutes. A current density of 1.0 amp./in.^{2} lay within a recommended range for chromium plating, which allowed direct comparison with the preceding tests using cathodic pickling. The temperature was also comparably fixed at 30°C. (122°F.).

* * *

FIGURE 10 displays the progress of embrittlement both for straight hydrogen plating (cathodic pickling) and for chromium plating, and for both annealed and cold-drawn wire.

* * *

IN both cases the bend values were reduced by chromium plating far below those for 100 per cent hydrogen plating. Nor can this great embrittlement be attributed to the mechanical nature of the plate, for specimens lying on the steep portion of the curve (plating time less than 10 minutes) could be aged back to the original bend values simply by removing hydrogen.

* * *

PLAINLY, chromium exerts a "promoter" **effect** during plating. It is not in the promoter group, however (see previous Figure 4), and causes no measurable increase in embrittlement when dissolved in solutions from which it does not plate. The shaded areas in Figure 10 show the extent to which hydrogen embrittlement from chromium plating exceeds that from 100% hydrogen plating and give striking illustration of the great liability to embrittlement that attends chromium plating.

Analysis: Cr = 17.08% Si = 0.15 C = 1.08 Mn = 0.48 S = 0.016 Ni = 0.28 P = 0.016 Mo = 0.52

Thermal Treatment	Mechanical Treatment (% Reduction in Area)	Ultimate Tensile Strength (psi)	Wire Size (ϕ in ins.)
I. FULL ANNEAL (in argon) 1650°F — 4 hrs. Cooled 25°-30°/hr. to 1100°F. Cooled to room temp. in ~ 1hr.	None	101,500/103,500 (BHN = 176-182)	0.059

Thermal Treatment	Mechanical Treatment (% Reduction in Area)	Ultimate Tensile Strength (psi)	Wire Size (ϕ in ins.)
II. MILL-ANNEAL 1550°F — 3 hrs. 25° / ½ hr. to 1200°F. Air Cool	29.0	100,000/105,000 (BHN = 215/240)	0.060

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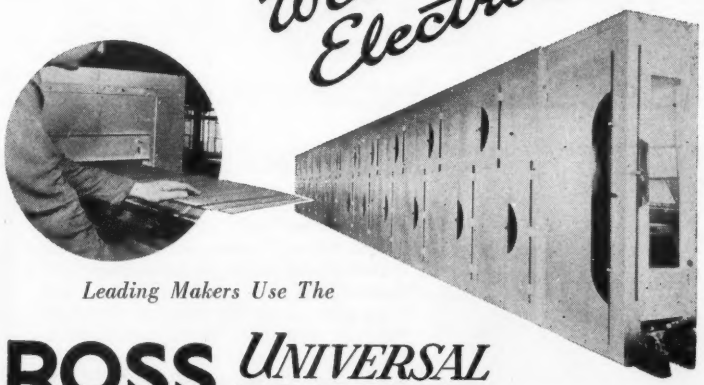

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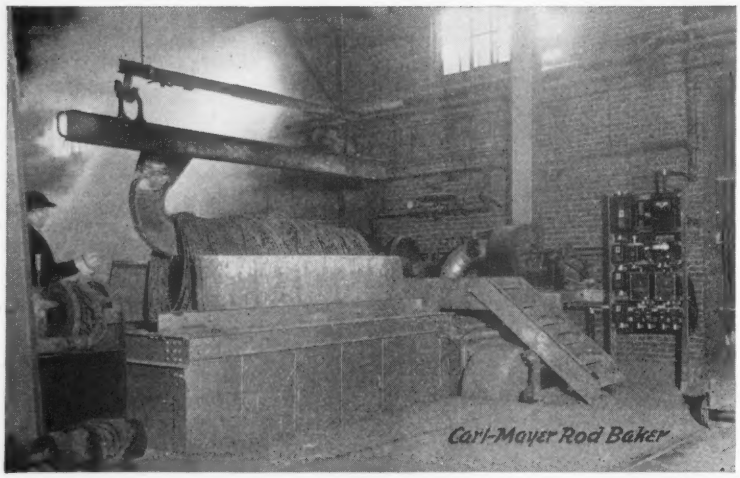

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Cadmium Plating

IN contrast to the inefficiency of chromium plating, cadmium plating operates at efficiencies commonly exceeding 90 per cent; and the plate is too soft to affect the steel mechanically, regardless of its thickness.

* * *

AN alkaline cyanide electrolyte of the following composition was used:

Cadmium oxide	= 32 gs./liter
Sodium Cyanide	= 75 "
Gelatine	= 2 "

ONCE again the temperature was fixed at 50°C. (122°F.) for the sake of comparison with previous work; but it was necessary to reduce the current density to only 0.21 amp./in.^{2} because of the nature of cadmium plating.

* * *

FIGURE 11 reveals the course of embrittlement during cadmium plating. The indecisive grouping of points in the center of the curve for annealed wire probably follows from the fact that cadmium, even more so than chromium, is known to be quite impermeable to hydrogen. Therefore, as the plate thickens, a point is reached where the infusion of hydrogen dwindles to ineffectiveness, and recovery of the basis metal accordingly begins to show itself just as though charging had stopped. This condition is particularly evident in the clear-cut upswing of the curve to the right of the indecisive area. With the cold-drawn wire, recovery during changing is evident only as a flattening of the curve, instead of a continuing drop, for cold-drawn wire recovers much more slowly than annealed wire[5].

* * *

IN Figure 12 the data for all three plating conditions are reproduced in a master plot. Note that even the small proportion of hydrogen deposited during cadmium plating is more effective in causing embrittlement than the plating of 100 per cent hydrogen, cutting the "incuba-

tion period" in half (range "A" in the previous Figure 2).

* * *

IN chromium plating, the "incubation period" virtually disappears. Whereas hydrogen plating causes no measurable defection in five minutes, chromium plating reduces the angle of bend to 120 degrees in only thirty seconds. Also note how greatly the chromium plating reduces all bend values for any given plating time, attaining angles of only 6 or 7 degrees with cold-drawn wire. Such material is strictly comparable to glass, so far as ductility is concerned.

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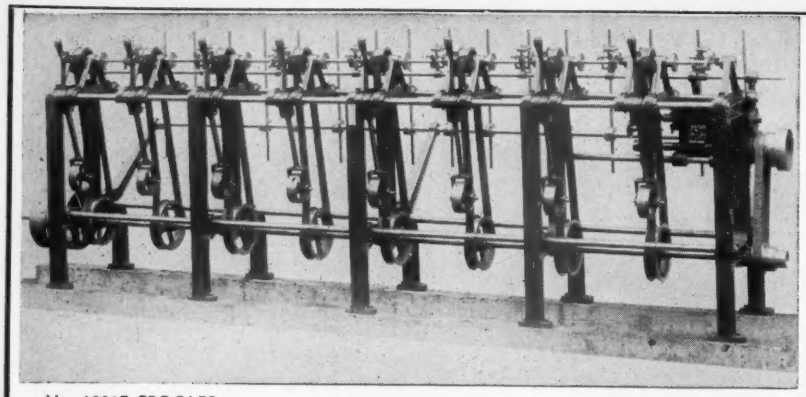

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A Guide to Work Simplification

(*Continued from page 359*)

4. **Design (tolerance, advantages of change).**
5. **Layout (eliminate back-tracking, aisle space, distances moved).**
6. **Work place layout (both hands doing useful work, chutes, hoppers).**
7. **Safety (safest as well as best way).**
8. **Housekeeping (work and storage areas clean and orderly).**

* * *

Develop the New Method

AFTER having thoroughly questioned each element on the operation chart, there will exist a good basis for the development of the new method. Suggestions are given below:

1. **ELIMINATE: All unnecessary elements should be eliminated.**
2. **COMBINE: Wherever possible, try to combine two or more operations. This can sometimes be done by changes in the work place, layout or tools.**
3. **SEQUENCE: Try to rearrange the sequence of the operation for better utilization of time and to encourage two-hand simultaneous operation.**
4. **SIMPLIFY: Investigate the possibility of making the job easier and simpler. To simplify is to save.**
5. **WRITE: Completely record your new method in detail. Make an operation chart of your new method.**

* * *

Install the New Method

HAVING finished writing up the new method, the best policy would be to talk it over with various people. Get their criticism, favorable and unfavorable. Fortified with all the data that you have compiled — such as the operation charts of the old and new method, blueprints, models, sketches, etc. — go in to see the person to whom the new idea must be sold.

* * *

SELL him the new method. Do not just tell him about it. Use a tactful approach and give him a short story about what has been done and what you propose to do. Answer all his questions in a

straight-forward way. Do not be afraid to mention the names of the men who helped you develop the new method.

* * *

AFTER securing the necessary approvals, pick the man you think is best suited to learn the new method. Sell him and teach him the new improved method. Keep close supervision over the job until he has become proficient at it. Then, if the method is to your satisfaction, have him teach the other men who perform the same job.

* * *

YOU have just completed the analysis. You have found the better way to do the job. Whatever name it goes under, whether it be work simplification, methods simplification, methods engineering or any other name, it serves the same purpose. Our country is still growing and industry leads the way. Always keep in mind that there is always a better way. Do not let another five, ten or fifteen years go by before that job is improved again.

* * *

C. M. White on Iron Ore and The Steel Industry

AN important address, delivered by **C. M. White,** President of the Republic Steel Corporation, before the American Institute of Mining and Metallurgical Engineers in March, outlines the history of steel and its relation to civilization, gives the status of world iron ore reserves and sets forth the outlook for the industry in the future.

* * *

MR. White's talk, while based on industry statistics, is more concerned with their interpretation than their presentation and sets forth some valuable suggestions and concludes with the statement:

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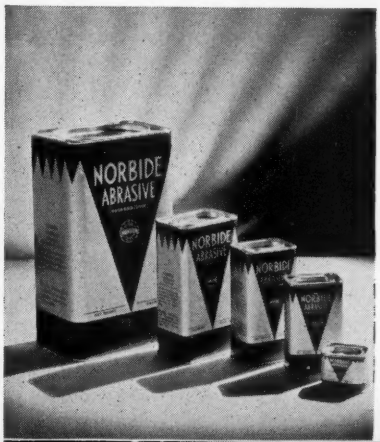

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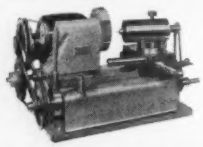

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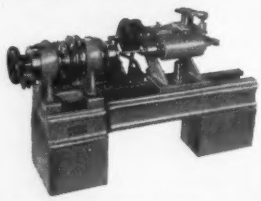

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ALCOA Produces New Film

A preview of a splendid sound motion picture was shown to the press by the **Aluminum Company of America** in New York City on March 13th.

* * *

THIS film shows the production of aluminum from the mining of the bauxite through to its fabrication into numerous finished products. It is entitled "This Is Aluminum" and provides thirty-five minutes of good entertainment and instruction. The chemistry of the operations is covered thoroughly. As aluminum constitutes 8% of the earth's crust, the difficult and complicated processes by which it is made available are of considerable interest and the Company has handled the production of this fine addition to its film library with adroitness and finesse.

* * *

THIS and other films that have been produced by Alcoa may be secured for group showings from the Motion Picture Department, Aluminum Company of America, 801 Gulf Bldg., Pittsburgh 19, Pa.

* * *

Microhardness of Steel

THE hardness, not only of a piece of steel, but of microscopic grains within the steel, can be measured by a new device designed at the Research Laboratories of **United States Steel Corporation** of Delaware at Kearney, N. J. Still more minutely, the new microhardness tester can gage the hardness of a single steel grain at as many as three points within the breadth of a human hair.

* * *

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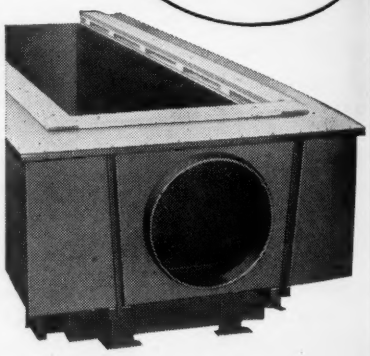

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A Review of Recent Wire Patents

(*Continued from page 375*)

March 25, 1947 by George M. Powell, 3d., South Charleston, W. Va., and Earl F. Carlston, Arlington, Va., assignors to Carbide and Carbon Chemicals Corporation, a corporation of New York.

This process comprises applying to the copper surface, a solution containing an organic solvent, water, ammonia, and one of the group consisting of water-insoluble partially hydrolyzed polyviyl esters, and water-insoluble polyvinyl acetal resins containing free hydroxyl groups, permitting the liquids of the solution to remain in contact with the copper surface until a bluish-green color is observed heating the applied coating at a temperature of at least 325° F., and forming an adherent, alcohol-insoluble film on the surface.

* * *

No. 2,418,075, RUST-PREVENTIVE COMPOSITION, patented March 25, 1947 by Myron H. Kollen, Ferndale, Mich, and Marcellus T. Flaxman, Whittier, Calif., assignors to Union Oil Company of California, Los Angeles, Calif., a corporation of California.

An anti-rust composition is provided comprising between about 5% and 95% of oil-soluble polyvalent metal tall oil soap and between about 5% and 85% of oil-soluble polyvalent metal degras soap.

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Applicators for Viscous Enamels
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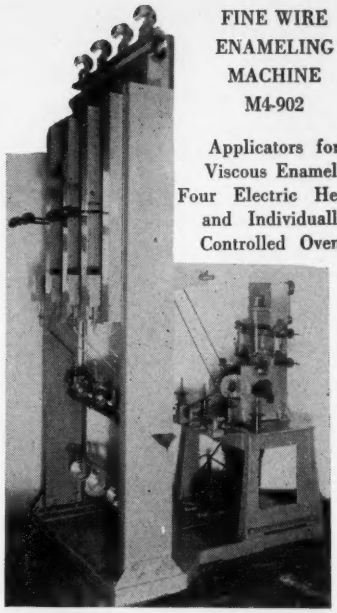

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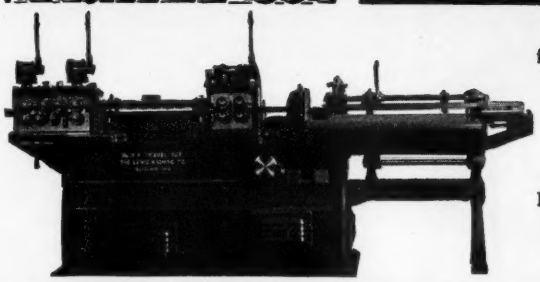

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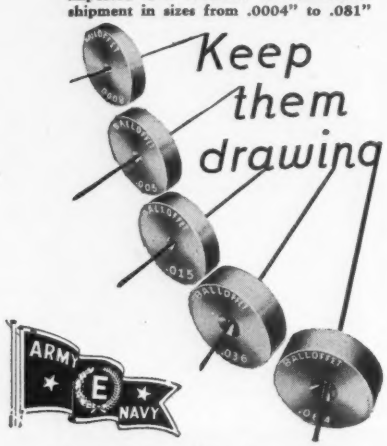

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ANNOUNCEMENT is made of a compact new bench type butt welder by Banner Products Co., 4947 N. 29th St., Milwaukee 9, Wis. The 10 KVA model shown is manufactured for either 220 or 440 volt, 60 cycle current.

* * *

OUTSTANDING features are eight ranges of heat, round steel guides for movable platten in oilite bushings, ample grease outlets and built in tap switch. Head is of high strength bronze, water cooled, and has good electrical conductivity. Transformer is water cooled with asbestos shield.

* * *

PERFECT alignment and precision welding is assured through use of 2" diameter air block on clamping jobs. The blocks maintain a constant pressure on material being welded.

* * *

OPERATION is started by a covered foot switch connected to a 4-way Solenoid air valve which brings clamps to position. Movable platen has left hand lever with pilot switch connection which closes to apply current at joint... at the same time hand lever is pulled toward stationary platen for upset. Current is automatically shut off by an adjustable limit switch. Air line equipment is included with machine.

* * *

OF interest to even the smallest shop is the fact that this compact modern butt welder is available at a nominal initial cost. Further information will be furnished on request.

* * *

Despatch Oven Appointments

C. P. Doherty, a veteran employee of the Despatch Oven Co., Minneapolis, has been made factory manager and **G. L. Schuster** was named chief engineer of the company. These two new officers will also serve on the board of directors as vice presidents.

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Atomic Energy on The Way

SCIENCE and industry stand ready today to repair a war-ravaged world and create a new abundance through peaceful adaptations of such discoveries as atomic energy, Dr. Zay Jeffries, General Electric vice-president and general manager of the Company's Chemical Department recently stated. He warned that the opportunity will be missed "if we put our great industrial machine in a straight jacket and disipate much of our energy in fighting futile and illogical class wars".

* * *

SPEAKING before a meeting of the American Institute of Mining and Metallurgical Engineers at the Waldorf Astoria, Dr. Jeffries predicted development of new techniques in metallurgy will result from nuclear energy research. He cited the use of radioactive tracers and controls as a method of determining the effects of a minute amount of impurities in metals.

* * *

IN predicting great expansion of the light-weight metal industry, the General Electric official asserted that continued development of new plastic materials would tend to increase rather than lessen the need for the metals. As an example, he cited the increased use of metal in automobiles as a result of advancements in rubber, which is a plastic.

* * *

"NOTHING on a broad front can take the place of metals," Dr. Jeffries said. "The science of metals is keeping pace with other sciences and since now science is leading the art in many instances, the metals relative to other materials should find their competitive place in the future economy."

* * *

THE speaker pointed out that the production of metals would have to multiply seven times if the rest of the world were to attain the same standard of living as the United States. Such a tremendous expansion, he said, would necessarily extend far into the future. Although iron and steel are available in sufficient quantity to permit more rapid expansion than some of the other metals, nevertheless, the other metals "are available in ample quantities to provide a rich industrial economy."

* * *

IN his discussion of atomic energy Dr. Jeffries said "We can speculate without end on the future of this field but no one knows what is ahead. Metallurgists, however, will not have performed their obligation to their profession until they have given their best toward the solution of the many problems incident to making nucleonics a servant and benefactor of mankind."

* * *

"THERE will be mere efficient utilization of the metals. High cost metals will be used more in combination with low cost materials. Alloys having long life will be given a high economic rating by designers and users. Engineers will be able to analyse the stresses in machines and structures so much better than now that safety factors can be greatly reduced. Tens of thousands of new combinations of properties will be pro-

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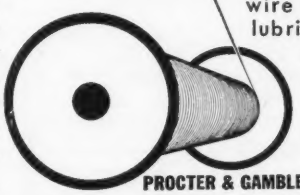

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vided by alloys of the future, each combination serving some particular use better than any other," he said.

* * *

"THE universities and colleges are better geared to give fundamental training in both the physics and chemistry of metals than at any previous time. The body of solid science is accumulating at a rapid rate. The younger generation of metallurgists excels not only in numbers but in knowledge of the tools and methods of research and engineering. Industry is conscious of the need for research as the only way to unlock nature's secrets and thus lay the foundation for their use," he said.

* * *

"OBVIOUSLY we cannot realize these possibilities if we put our great industrial machine in a straight jacket and dissipate much of our energy in fighting futile and illogical class wars. Not only is our potential surplus production needed abroad to rehabilitate shattered economies but even more needed for the sustained hope of millions of people tottering on the brink of political chaos is the shining example, within our power to provide, of freedom with abundance. Putting our house in order at home would give help and encouragement to many war torn peoples and do more than any other one thing to start the world on the road to peace and plenty. If statemen can keep pace with science and industry we are even now on the threshold of a great advance in the metal industry," be stated.

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British Wire Industry Expanding

THE expansion of the British wire drawing industry was referred to by Mr. **Ashley S. Ward,** chairman and managing director of **Marshall Sons and Co. Ltd.,** Gainsborough when he told shareholders of the very considerable expansion to existing plants and entry into new fields of activity.

* * *

HE stated — "I am pleased to be able to tell you that modernization of plant and manufacturing facilities at Gainsborough have continued throughout the year. The change over of our productions onto a peace-time footing is nearly complete.

* * *

"WE are now beginning to reap the benefits from the rationalisation of our products which has taken place during the past two years."

* * *

MR. Ward said that although their Gainsborough plant was capable of absorbing more workers at present that was impossible in view of the shortage of housing. The firm had therefore decided to take on only new workers if they were already suitably housed in the area.

* * *

MR. Ward went on — "You are aware that our subsidiary company, **The Marshall Richards Machine Company Ltd.,** enjoys an enviable international reputation for wire drawing and ancillary machinery for which there is a large demand, particularly from Canada, South Africa, Sweden, Belgium, Switzerland, and France; before the war one of our chief competitors in the trade was Germany. To enable us to deal with the increased demand both for export and from the home market and because of the shortage of labour in Gainsborough this business has, during the year, been transferred to an ex-Government factory at Crock, County Durham, a development area where labour suitable for the purpose is available. Mr. Joseph Watson has resigned from our board in order to take up his duties as

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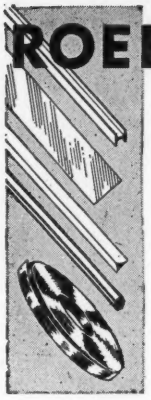
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a director of this company. By concentrated effort and splendid cooperation between management and staff I am pleased to report that the Crook factory has been put into peace-time operation with commendable speed. While the acquisition of the Crook factory would relieve the demand for wire drawing machinery, it was obvious to your Board that still further facilities were needed to take full advantage of another section of our business — namely, the heavy Diesel tractor market." Mr. Ward ended by indicating that the firm had acquired the whole of the Ordinary share capital of John Fowler and Co. (Leeds) Ltd., manufacturers of Diesel engines, Diesel locomotives, and track-laying tractors, who possess large and well-equipped works at Leeds, at present employing a similar number of people to the Gainsborough works.

Loewy Engineering Company Gets Rolling Mill Order

THE contract for the complete most up-to-date rolling mill equipment for a new steel plant to be erected in Sweden has been placed with **The Loewy Engineering Company.**

* * *

THE plant will be in operation in 1949, and The rolling mill, which will cost aproximately $10,000,000, will turn out over 700,000,000 lbs. of rolled steel per year.

Portable Air Operated Gun Welder

A new rocker-type model portable gun welder, greatly extending the range of application has been placed on the market by the **Eisler Engineering Co., Inc.,** Newark 3, New Jersey. The unit is an air operated welding machine with a double acting air machine with a double acting air cylinder and the necessary operating mechanism. The air cylinder is

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placed inside the construction, between the lever arms, and transmits the pressure to the electrodes by lever action.

* * *

THIS cylinder arrangement is one of the novel features of this latest Eisler gun welder model, providing a free working space all around the horns, increasing the welding possibilities in hard-to-get-areas. The power pact consists of an air-cooled transformer with an 8-tap switch (7 "on" and 1 "off"), a pneumatically or electronically actuated timer and a high speed mechanical or electronic contactor for accurately timing the weld in speed or automatic repeat of strokes. The welding cycle is initiated by foot switch or push button.

* * *

THE head of the machine that holds the welding arms consists of bronze castings, with two middle parts — the upper forked — embracing a shaft and point to the others in such a way as to permit the horns to swivel about the shaft as a fulcrum. Transformer and head are connected by a water-cooled low impedance cable and suspended on an overhead beam. Flexible copper straps carry the current from the cable to the electrodes. The horns are made from hard drawn copper and can easily be exchanged to fit throat depths ranging from 8 to 24 inches.

* * *

THE KVA rating of the welder is from 30 up to 75 KVA. The machine is suitable for spot welding of sheet metal of light gage, but will also weld heavier work when supplied with short holders. This type of welding unit can be readily moved to any work in the shop that cannot be brought to a stationary welding machine.

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Index To Advertisers

A

Ajax Industrial Supplies, Inc. 388
Aluminum Company of America 331
American Chemical Paint Co. 377
American Cyanamid Co., Industrial Chemicals Division 339
American Insulating Machinery Company 385
American Steel & Wire Co. 345
Anchor Wire Corp. 388
Apco Mossberg Company 385
Apex Alkali Products Co. 389

B

Balloffet Dies & Nozzle Co., Inc. 386
Bethlehem Steel Co. 326
Boyd, Charles P., Corp. 387
Bridge Mfg. Co., The 367

C

Carboloy Company, The 325
Carl-Mayer Corp., The 380
Ceilcote Co., The 386
Champion Diamond Co., Inc. 388
Cleveland Tramrail Division of the Cleveland Crane & Engineering Co. 328
Cochaud Wire Die Corporation 388
Columbia Steel Co. 345
Continental Steel Corporation 336
Crepe-Kraft Co., The 390

D

DuPont, E. I. de Nemours Co. 335
Durant Mfg. Co. 390

E

Eastern Tungsten Carbide Co. 388
Eisler Engineering Co. 390
Electric Furnace Company ..... Back Cover
Emory, Robert J. Company 382
Entwistle, James L., Co. 342

F

Firth-Sterling Steel Company 350
Fits-All Tool & Die Co. 388
Fort Wayne Wire Die, Inc. 388
Furnace Engineers, Inc. 390

G

Glader, Wm. Machine Works 369

H

Haveg Corporation 384
Hayes, C. I. Co. 378
Howsam Spool Co. 390
Hubbard Spool Company 391
Hudson Wire Co. 332
Hughesville Machine & Tool Company 370

I

Indiana Wire Die Company 388
Industrial Ovens, Inc. 376

J

Johnson Steel & Wire Co., Inc. 380
Jones & Laughlin Steel Corp. 357

K

Keagler Brick Company 388
Kelly Wire Die Corporation 388
Keystone Steel & Wire Co. 365

L

Lancaster Allwine & Rommel 391
Lewis, K. B. 391
Lewis, Machine Co., The 385

M

Magnus Chemical Company 344
Malin & Company, The 390
Metal Carbides Corporation 389
Michigan Wire Die Co. 381
Micro Products Company 364
Miller, R. H. Company, Inc. 374
Morgan Construction Company 348
Morrison Engineering Corp. 368
Mossberg Pressed Steel Corp. 390

N

National Annealing Box Co. 390
National Erie Co. 372
National Machinery Exchange 391
New England Butt Co. 333
New England Wire Die Co. 388
Nilson, A. H. Machine Co. 381
Niles Steel Products Div., Republic Steel Corp. 349
Norton Company, The 383
North American Philips Co., Inc. 389

O

Oakite Products, Inc. 387
O'Neil-Irwin Mfg. Co. 390
Owens-Corning Fiberglas Corp. 343

P

Parkin Wm. M. Co. 390
Platt Brothers & Co., The 390
Porter, H. K., Inc. 386
Potter, Neil C. 389
Procter & Gamble 387

R

Reed and Richards Transatlantic, Inc. 373
Reynolds Wire Company 340
Robertson, John Co., Inc. 337
Roebling's, John A., Sons Company 389
Roos, H. & G., Tool & Mfg. Co. 384
Ross, J. O., Engineering Co. 379
Royle, John & Sons 371
Ruesch, H. J., Machine Co. 390
Rusch Wire Die Corporation 388

S

Sauereisen Cements Co. 391
Scott Testers, Inc. 390
Scudder, E. J. Foundry & Machine Co. 389
Seifert, E. R., Inc. 391
Shuster, F. B., Mfg. Co., The 366
Sleeper & Hartley, Inc. 389
State Machine Tool Co. 389
Standard Industrial Compounds Co. 341
Standard Varnish Works 338
Surface Combustion Corp. 391
Syer, Raymond C. 391
Syncro Machine Company 330

T

Tennessee Coal, Iron & R. R. Co. 345
Torrington Manufacturing Co. 389
Trauwood Engineering Co., The 383
Tungsten Alloy Mfg. Company 388

U

Union Wire Die Corp. 375
U. S. Steel Export Co. 345
U. S. Steel 345

V

Van Itallie Corp. 388
Vascoloy-Ramet Corp. 329
Vaughn Machinery Co. ..... Front Cover
Vianney Wire Die Works 386

W

Warren Thread Works, W. 327
Waterbury-Farrel Foundry and Machine Co. 389
Watson Machine Company ..... Inside Back Cover
Wayne Wire Die Co. 388
Wean Equipment Corp. ..... Inside Front Cover
Wilson, Lee, Engineering Co., The 390
Wire & Textile Machinery, Inc. 385

Y

Youngstown Sheet & Tube Company 334

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ABRASIVES—
Norton Co., Worcester, Mass.

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American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

ACID-PROOF CONSTRUCTION—
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corporation, Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

AIR DRAW FURNACES
Carl-Mayer Corp., Cleveland, Ohio.

ALKALINE CLEANERS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Perth Amboy, N. J.

ANNEALING POTS AND BOXES—
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J

ARMORING EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ross, J. O. Engr. Corp., New York, N. Y.

BENDERS—
O'Neil-Irwin Mfg. Co,. Minneapolis,. Minn.

BOBBINS—Braider & Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

BORON CARBIDE
Norton Co., Worcester. Mass.

BRAKES—Pneumatic
Entwistle, Jas. L. Co., Pawtucket, R. I.

BRAKES & SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn..

BRICKS—Acid Proof
Keagler Brick Co., Steubenville, Ohio.

CABLE LACQUERING OVENS
Industrial Ovens, Inc., Cleveland, O.

CABLE—Steel and Copper
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.

CASTINGS—Wire Mill
Scudder, E. J. Fdry. & Mach. Co., Trenton. N.J.

CEMENTS—Acid Proof
Sauereisen Cements Co., Pittsburgh, Pa.
Ceilcote Co., The, Cleveland, Ohio.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

CHEMICALS—Stearates
American Cyanamid Co., Industrial Chemicals Div., New York, N. Y.

CLEANERS—Hand and Metal
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.
Apex Alkali Products Co., Phila, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANING & PICKLING EQUIP.—
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corporation, Newark, Del.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

CLOTH TESTERS—
Scott Testers, Inc., Providence, R. I.

CLOTH—WIRE. All Metals
Reynolds Wire Co., Dixon, Ill.
Roebling's John A. Sons, Co., Trenton, N. J.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

COILERS—Sheet, Strip and Wire
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J. Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

COLD HEADERS—
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds, Co., Chicago, Ill.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago. Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Champion Diamond Co., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Van Itallie Co., The, New York, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Champion Diamond Co., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Union Wire Die Corp., New York, N. Y.
Van Itallie Co., The, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND TOOLS—
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
New England Wire Die Co., Worcester. Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Lead Extrusion
Eastern Tungsten Carbide Co., Newark, N. J
Robertson, John, Co., Brooklyn, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies Co., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Fit-All Tool & Die Co., Bronx, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Co., Detroit, Mich.
New Eng. Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Union Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Tungsten Carbide Co., Newark, N. J
Firth Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Works, Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc. Guttenburg N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenburg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Fit-All Tool & Die Co., Bronx, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Tungsten Alloy Mfg. Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIRECT ELECTRIC RESISTANCE HEATING—
Trauwood Engineering Co., The, Cleveland Ohio.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N.J.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

DRYING & PRE-HEATING ROOMS—
Carl-Mayer Corp., Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O. Engr. Corp., New York, N. Y.

ENGINEERS—Consulting Wire Mill
Lewis, Kenneth B., Worcester, Mass
Syer, C. Raymond, Westport, Conn.

EQUIPMENT—Insulation Testing
Entwistle, James L., Co., Pawtucket, R. I

EYELETS—Brass or Zinc
Platt Bros., & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engrs. Inc., Pittsburgh, Pa.
Hayes, C. I. Co., Providence, R. I.
Morrison Engineering Corp., Cleveland, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland Ohio.
Wilson, Lee Engr. Co., Cleveland, Ohio

WHERE TO BUY, Continued

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem. Ohio.
Morrison Engineering Corp., Cleveland, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Hayes, C. I., Co., Providence, R. I.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Galvanizing Equipment
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Morrison Engineering Corp., Cleveland, Ohio.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Morrison Engineering Corp., Cleveland, Ohio.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Salt Bath
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corporation, Toledo, O.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Morrison Engr. Corp., Cleveland, Ohio
Surface Combustion Corporation, Toledo, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GRINDERS—Roll
Norton Co., Worcester, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of Cleveland.
Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M. Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Du Pont, E. I. de Nemours Co., Wilmington, Del.
Owens-Corning Fiberglas Corp., Toledo, Ohio.
Standard Varnish Wks., Staten Island, N. Y.
Warren W., Thread Works, New York, N. Y.

KETTLES—Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Penna.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N.J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

LININGS—Acid and Alkali Proof
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corporation, Newark, Del.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bale Tie
Reed and Richards Transatlantic, Inc., New York, N. Y.

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Entwistle, Jas. L. Co., Pawtucket, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Coilers
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Copper Wire Drawing and Rolling
American Insulating Mach'y Co., Phila, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila, Pa.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
National Mach'y Exch., (Used), New York, N.Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Porter, H. K. Inc., Everett, Mass.
Shuster, F. B. Mfg., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Roos, H. & G., Tool & Mfg. Co. Montclair, N.J.
Union Wire Die Co., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, O.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
National Erie Corp., Erie, Pa.
Robertson John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Fence
Glader, Wm. Machine Works, Chicago, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Forming
Eisler Engineering Co., Newark, N. J.
National Mach'y Exch. (Used), New York, N. Y
Nilson, A. H. Machine Co., Bridgeport, Conn
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Reed and Richard Transatlantic, Inc., New York, N. Y.
Seifert, E. R., Inc., Syracuse, N. Y.
Sleeper & Hartley, Inc, Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Galvanizing
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co, Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila, Pa.
National Erie Corp., Erie, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail, Div. of the Cleveland.
Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm. Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.

WHERE TO BUY, Continued

MACHINERY—Pointing
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber for Insulating Wire
Royle, John & Sons, Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Screw Wire
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc, Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila, Pa.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
National Erie Corp., Erie, Pa.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd, Charles P., Corp., Philadelphia, Pa.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N .J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Reed and Richards Transatlantic, Inc., New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Lewis Machine Co., The, Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Stranding
Hubgesville Machine & Tool Co., Hughesville, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Mach'y Exch. (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J
Sleeper & Hartley Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N .J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N .J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing Equipment—Sparkers
Entwistle, Jas. L., Pawtucket, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
National Erie Corp., Erie, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Industrial Ovens, Inc., Cleveland, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila, Pa.
Eisler Engineering Co., Newark, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J .

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Torrington Mfg. Co., Torrington, Conn.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O. Engr. Corp., N. Y., N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER—For Coil Wrapping and Corrosion Prevention
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D.C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING TANK LININGS—
Ceilcote Co., The, Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.
Haveg Corporation, Newark, Del.

PIPES & FITTINGS—Acid Resistant
Ceilcote, Co., The, Cleveland, Ohio.
Haveg Corporation, Newark, Del.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio.

POTS—Lead Melting
National Annealing Box Co, Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co,. Phila, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc, Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REELS—Annealing and Stranding
Howsam Spool Co., Aurora, Ill.

REEL AND TENSION STAND—
Industrial Ovens, Inc., Cleveland, Ohio.
Sleeper & Hartley, Inc, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

WHERE TO BUY, Continued

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Bridge Manufacturing Co., Hazardville, Conn.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster. F. B., Mfg. Co., New Haven, Conn.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div. Republic Steel Corp., Niles, Ohio.

REELS—Wooden
Bridge Mfg. Co., The, Hazardville, Conn.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Morrison Engr. Corp., Cleveland, Ohio
Ross, J. O. Engr. Corp., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

SATURATION SYSTEMS
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Procter & Gamble, Cincinnati, Ohio
Standard Industrial Compounds Co., Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company,. Chicago, Ill
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

SPRINGS—Tools for Forming
State Machine Tool Co., Hartford, Conn.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STEARATES—For Wire Drawing
American Cyanamid Co., Industrial Chemicals Div., New York, N. Y.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANK LININGS—Brick
Ceilcote Co., The, Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.

TANK—Compound
Haveg Corporation, Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corporation, Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
National Annealing Box Co., Washington, Penna.

TOOLS—Wire Cutting
Porter H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe. O.

TRAVERSES—For Reels
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

TREADS—Safety
Norton Co, Worcester, Mass.

TUBE BENDERS AND FORMERS—
Ruesch, H. J. Machine Co., Newark, N. J.

VALVES & FITTINGS—Acid Resistant
Haveg Corporation, Newark, Del.

VARNISHES—For Insulation
Standard Varnish Wks., Staten Island, N. Y.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila, Pa.
Entwistle, James L. Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, O.
Watson Machine Co., Paterson, N. J.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa.
Malin & Co., Cleveland, Ohio.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Enameled for Coils
North American Philips Corp., New York, N.Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn

WIRE—Manufacturers
American Steel & Wire Co., Cleveland-Chicago-New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Firth Sterling Steel Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Reynolds Wire Co., Dixon, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Music
Johnson Steel & Wire Co., Inc., Worcester, Mass
Malin & Co., Cleveland, Ohio.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specification for Special Purposes
Anchor Wire Corp., Jamaica, N. Y.
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted Conn

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland-Chicago-New York.
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's John A., Sons Co., Trenton, N. J.
Reynolds Wire Co., Dixon, Ill.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Reynolds Wire Co., Dixon, Ill.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARNS & TAPES
Du Pont, E. I. de Nemous Co., Wilmington, Del.
Owens-Corning Fiberglas Corp., Toledo, Ohio
Warren W., Thread Works, New York, N. Y.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

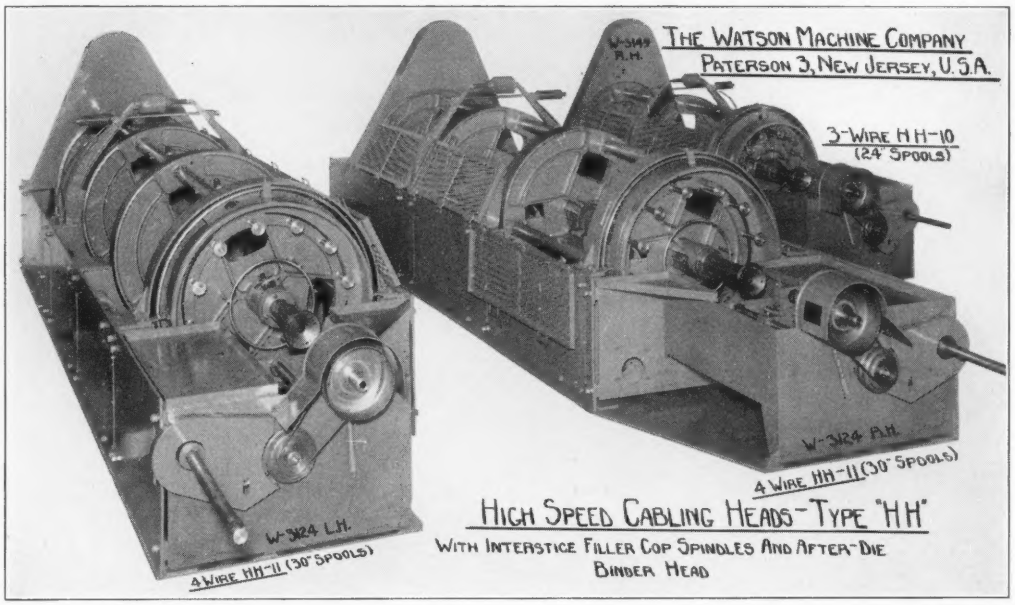
Wire and Wire Products

May, 1947

ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY

HIGH SPEED CABLERS TYPE "HH"

EASE OF OPERATION, RIGID CONSTRUCTION and **HIGHEST SPEEDS** are some of the outstanding advantages offered in this design.



HIGH SPEED CABLING HEADS - TYPE "HH"

WITH INTERSTICE FILLER COP SPINDLES AND AFTER-DIE BINDER HEAD

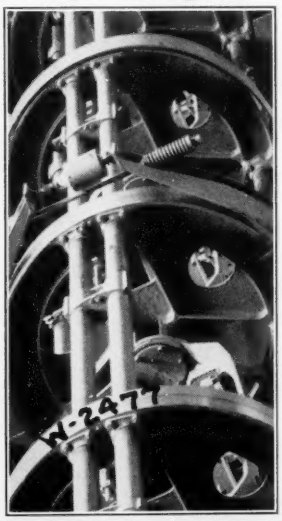
Heads shown above are for cabling of insulated conductors. They are of "SINGLE-SPAN-BAR" construction, where in **each** spool section **three** alloy steel tubes circumferentially act as double ended cantilever beams in resisting torsion, and radially as rigid ended beams in resisting centrifugal force effects. In rotors accommodating **four or more** spools, "TWIN-SPAN-BAR" construction (see cut below) is employed. Construction is very rugged and the same design serves also for bare wire stranding and wire rope closing. The rotor is supported by phenolitic rollers in adjustable eccentric mounts and housed in a rigid tank frame. Steel and anti-friction bearing construction prevails throughout. Automatic "air-released" brakes stop rotor from full speed in **six seconds.**

"Open" construction with "low" lead angles and "accessibility" of all adjustment and guide points reduce "idle time" to a minimum. The machine output is so high that some users have dubbed these heads as **"THE SQUIRT GUN."**

AVAILABLE IN THREE SIZES, viz:

No. 10 for 24″ Spools, No. 11 for 30″ Spools and No. 12 for 40″ Spools. A wide selection of auxilliaries (capstans, take-ups, etc.) to match any desired performance is available and usually supplied by us with complete machines.

Literature and Data Sheets available for all prospective users.



NOTE: Casual observers may dismiss this design as a revival of the old tie-rod-thru-length "Snake" or "Bar" machines **which it is definitely not.** In achieving **great rotor rigidity** in a **low inertia construction** the **"HH"** design, as compared with tubular heads of same purpose and size, requires **less power** and operates at **higher speeds** while retaining all of the advantages which the open construction affords.

EF

GAS FIRED, OIL FIRED and ELECTRIC FURNACES
for any heat treating requirement

● EF furnaces are built in many different types—suited for performing a wide variety of different heat treating processes. They are available in sizes to meet any capacity requirement, and reflect the advantage of the many service-proved features conceived and perfected by EF engineers, during the company's 30 years experience,—and available only in EF furnaces. These include the EF radiant tube, EF heat exchanger, EF alloy steel electric grids, EF roller design and mounting, EF atmosphere generators and many other devices that assure uniform temperature throughout the furnace—more accurate control of the heat within the required limits, low stack temperatures, increased outputs, reduced maintenance, and uniform, low cost, dependable operation.

Investigate the EF advantages—and let EF engineers, with their long and outstandingly successful record, work with you on your next heat treating job.

EF

THE ELECTRIC FURNACE CO.

WILSON ST. AT PENNA. R.R.

GAS FIRED, OIL FIRED AND ELECTRIC FURNACES
FOR ANY PROCESS, PRODUCT OR PRODUCTION

Salem-Ohio